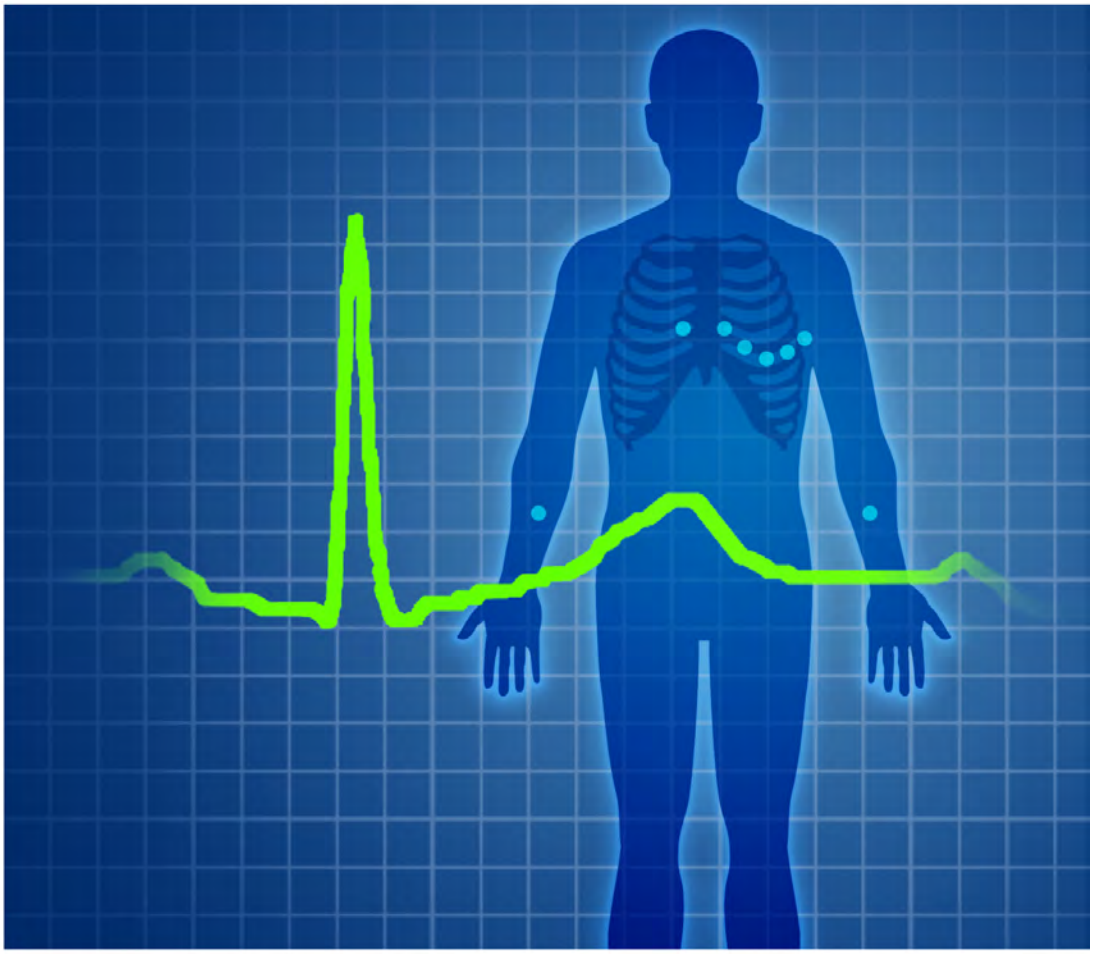

PageWriter Trim I/II/III/Rx Cardiograph Service Manual

PHILIPS

Notice

About This Edition

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WARNING

As with electronic equipment, **Radio Frequency** (RF) interference between the cardiograph and any existing RF transmitting or receiving equipment at the installation site, including electrosurgical equipment, should be evaluated carefully and any limitations noted before the equipment is placed in service.

Radio frequency generation from electrosurgical equipment and close proximity transmitters may seriously degrade performance.

WARNING

Like all electronic devices, this cardiograph is susceptible to electrostatic discharge (ESD). Electrostatic discharge typically occurs when electrostatic energy is transferred to the patient, the electrodes, or the cardiograph. ESD may result in ECG artifact that may appear as narrow spikes on the cardiograph display or on the printed report. When ESD occurs, the cardiograph ECG interpretation may be inconsistent with the physician interpretation.

Philips Medical Systems assumes no liability for failures resulting from RF interference between Philips Medical Systems medical electronics and any radio frequency generating equipment at levels exceeding those established by applicable standards.

CAUTION

The use of parts or accessories other than those approved by Philips Medical Systems may compromise product performance.

United States federal law restricts this device to use by or on the order of a physician.

THIS PRODUCT IS NOT INTENDED FOR HOME USE.

Medical Device Directive

The PageWriter Trim cardiograph complies with the requirements of the Medical Device Directive 93/42/EEC and carries the CE 0123 mark accordingly.

Authorized EU-representative:

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Germany

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1

Introduction

This Service Manual provides the information you need to successfully service the PageWriter Trim cardiographs and cart system. PageWriter Trim includes the following four models.

PageWriter Trim model	Philips Part Number
PageWriter Trim III	860286
PageWriter Trim II	860288
PageWriter Trim I	860290
PageWriter Trim Rx	860287

This manual includes information on:

- Theory of operation
- Maintenance procedures
- Performance verification and safety testing
- Repairs
- Ordering parts and supplies
- Specifications
- Maintenance tests

Before servicing the PageWriter Trim cardiographs, review the *PageWriter Trim Instructions for Use* and *PageWriter Trim Cardiograph Getting Started Guide* shipped with the product. This manual assumes you are familiar with the controls, basic cardiograph operations, and capabilities of the device as described in these documents.

This chapter provides general technical information that you should know before servicing the PageWriter Trim cardiographs. It is organized into the following sections:

Who Should Use this Manual 1-2
Important Patient and Safety Information. 1-3
Features and Capabilities. 1-5
Tour of the Device 1-6
General Service Information 1-10
Ordering Supplies, Options and Accessories 1-15
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Other Resources. 1-18

Who Should Use this Manual

This manual is for users who handle preventive maintenance, periodic operational checks, and basic troubleshooting for PageWriter Trim cardiographs.

Before attempting to service the cardiographs, you must review the following documentation and training materials:

- *PageWriter Trim Instructions for Use*
- *PageWriter Trim Cardiograph Getting Started Guide*
- *PageWriter Trim Cardiograph Interactive Training Program*
- This Service Manual

Conventions Used in this Guide

The documentation and training materials use the following typographic conventions.

Item	How Displayed
Menu item **Button name**	Menu items and button names appear in a bold font. *Example:* Select **Config**.
Keyboard keys	Keyboard keys appear in italic font. *Example:* Press *Enter* after typing the name.

WARNING **Warning statements describe conditions or actions that may result in personal injury or loss life.**

CAUTION Caution statements describe conditions or actions that may result in damage to equipment or software.

NOTE Notes provide additional important information about a topic.

TIP Tips provide suggestions for alternative ways of performing tasks.

Important Patient and Safety Information

The PageWriter Trim cardiograph isolates all connections to the patient from electrical ground and all other conductive circuits in the cardiograph. This reduces the possibility of hazardous currents passing from the cardiograph through the patient's heart to ground.

WARNING **Failure to follow these warnings could affect both patient and operator safety.**

- When operating the cardiograph on AC power, ensure that the cardiograph and all other electrical equipment connected to or near the patient are effectively grounded.
- Use only grounded power cords (three-wire power cords with grounded plugs) and grounded electrical outlets. **Never** adapt a grounded plug to fit an ungrounded outlet by removing the ground prong or ground clip. If an ungrounded plug adapter is required, use a ground strap to connect the equipotential port (rear of the cardiograph) to the power source ground. Use the equipotential port when redundant earth ground is necessary according to IEC 60601-1.
- If a safe ground connection is not ensured, operate the cardiograph on battery power only.
- The use of equipment that applies high frequency voltages to the patient (including electrosurgical equipment and some respiration transducers) is not supported and may produce undesired results.

WARNING **Do not touch accessible connector pins and the patient simultaneously.**

Electrical shock hazard. Keep cardiograph, Patient Interface Module (PIM) and all cardiograph accessories away from liquids. Do not immerse cardiograph, PIM, or other accessories in any liquids.

- Periodically inspect the patient data cable, lead wires, and AC power cord for any worn or cracked insulation.
- Keep the patient data cable away from power cords and any other electrical equipment. Failure to do so can result in AC power line frequency interference on the ECG trace.
- The Philips Medical Systems patient data cable (supplied with the cardiograph) is an integral part of the cardiograph safety features. Use of any other patient data cable may compromise defibrillation protection and degrade cardiograph performance.
- Only qualified personnel may service the cardiograph or may open the cardiograph housing to access internal cardiograph components. Do not open any covers on the cardiograph. All internal components must be serviced by qualified personnel.
- Do not use this cardiograph near flammable anesthetics. It is not intended for use in explosive environments or in operating rooms.
- The use of the analog ECG output signal port (not supported on cardiograph) should not be used when critical synchronization timing is required.

- Do not touch the patient, patient data cable, or cardiograph during defibrillation. Death or injury may occur from the electrical shock delivered by the defibrillator.
- Ensure that the electrodes or lead wires do not come in contact with any other conductive materials (including earth-grounded materials) especially when connecting or disconnecting electrodes to or from a patient.
- Connecting multiple cardiographs to the same patient may pose a safety hazard due to the summation of leakage currents. Any combination of instruments should be evaluated by local safety personnel before being put into service.
- Do not pull on the paper while an ECG report is being printed. This can cause distortion of the waveform and can lead to potential misdiagnosis.
- Do not connect any equipment to the cardiograph RS-232 port that does not meet medical safety requirements and that has not been evaluated by local safety personnel.
- Equipment connected to the cardiograph RS-232 port can cause ground leakage currents exceeding the maximum specified in IEC 60601-1 safety standards.
- Do not connect any equipment to the cardiograph RS-232 port if a patient is connected to the cardiograph.
- Only use the Philips Medical Systems AC power cord supplied with the cardiograph. Periodically inspect the AC power cord and AC power connector to ensure that both are in a safe and operable condition. If the AC power cord or AC power connector is not in a safe or operable condition, operate the cardiograph on battery power and contact Philips Medical Systems for service.
- The cardiograph has been safety tested with the recommended accessories, peripherals, and leads, and no hazard was found when the cardiograph is operated with cardiac pacemakers or other stimulators.
- Do not connect any equipment or accessories to the cardiograph that are not approved by Philips Medical Systems or that are not IEC 60601-1 approved. The operation or use of non-approved equipment or accessories with the cardiograph is not tested or supported, and cardiograph operation and safety are not guaranteed.

WARNING **When using additional peripheral equipment powered from an electrical source other than the cardiograph, the combination is considered to be a medical system. It is the responsibility of the operator to comply with IEC 60601-1-1 and test the medical system according to the requirements. For additional information contact Philips Medical Systems.**

Do not use non-medical peripherals within 6 feet of a patient unless the non-medical peripherals receive power from the cardiograph or from an isolation transformer that meets medical safety standards.

- Only install Philips Medical Systems software on the cardiograph. The installation or use of software not approved by Philips Medical Systems is strictly prohibited and cardiograph safety and performance are not guaranteed.

- Only use Philips Medical Systems replacement parts and supplies with the cardiograph. The use of non-approved replacement parts and supplies with the cardiograph is strictly prohibited. Cardiograph safety and performance are not guaranteed when non-approved replacement parts and supplies are used with the cardiograph.
- Manual measurements of ECG intervals and magnitudes should be performed on printed ECG reports only. Do not make manual measurements of ECG intervals and magnitudes on the touch screen display since these ECG representations are scaled.
- Only use patient electrodes that are approved by Philips Medical Systems. The use of non-approved patient electrodes may degrade cardiograph performance.
- The Philips Medical Systems warranty is applicable only if you use Philips Medical Systems approved accessories and replacement parts.

Features and Capabilities

The Philips PageWriter Trim cardiograph has four models: PageWriter Trim III, PageWriter Trim II, PageWriter Trim Rx, and PageWriter Trim I. The PageWriter Trim family of cardiographs are economical, interpretive, lightweight cardiographs with a remote digital patient module. The cardiograph contains the controls, the printer, and all the processing circuitry.

Features

The features of the PageWriter Trim cardiographs include:

- Battery or AC operated
- Remote digital acquisition module with replaceable patient leads. Capability for up to 12 leads
- 640 x 480 Color and Mono LCD for PageWriter Trim III/II/Rx, 40 x 2 Character LCD for PageWriter Trim I
- Data to ECG Management system in XML format via modem or LAN for PageWriter III/II/Rx
- Optional cart with convenient storage areas for supplies

Capabilities

- Downloads patient data from HIS with a barcode, magnetic card swipe, or smart card swipe
- Stores ECGs via PC Card
- Transmits ECGs by FAX, PCMCIA-modem, or LAN

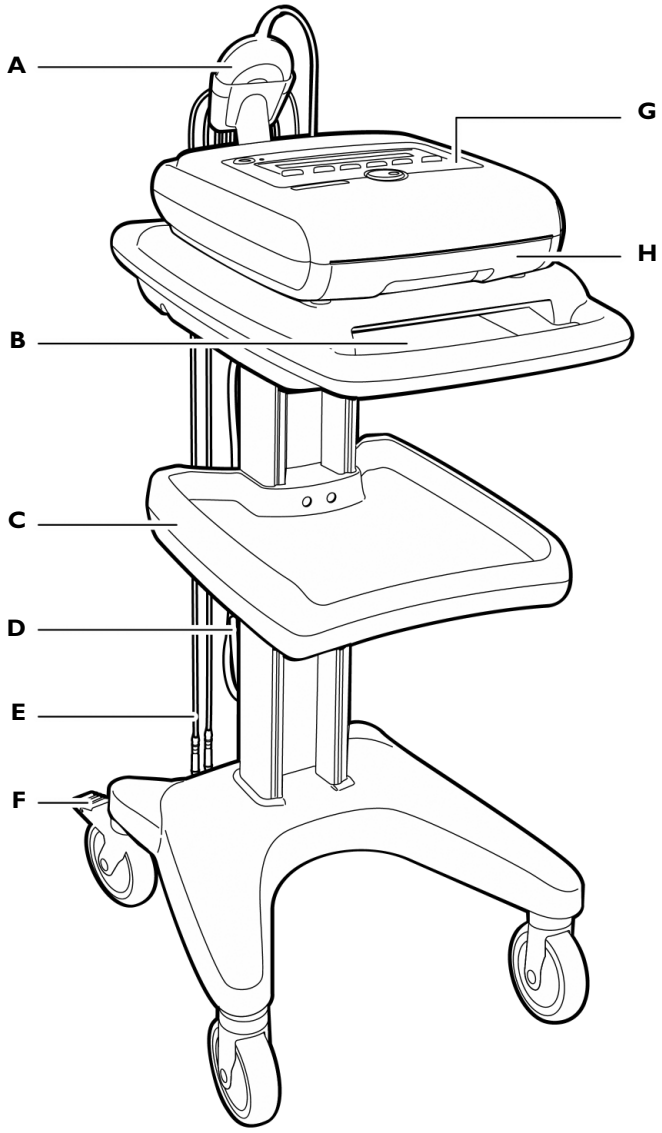
Tour of PageWriter Trim Cardiographs

This section gives an overview of the outside of the cardiographs, as well as the Patient Interface Module (PIM). For additional details, see the *PageWriter Trim Instructions for Use*.

PageWriter Trim I Cardiograph

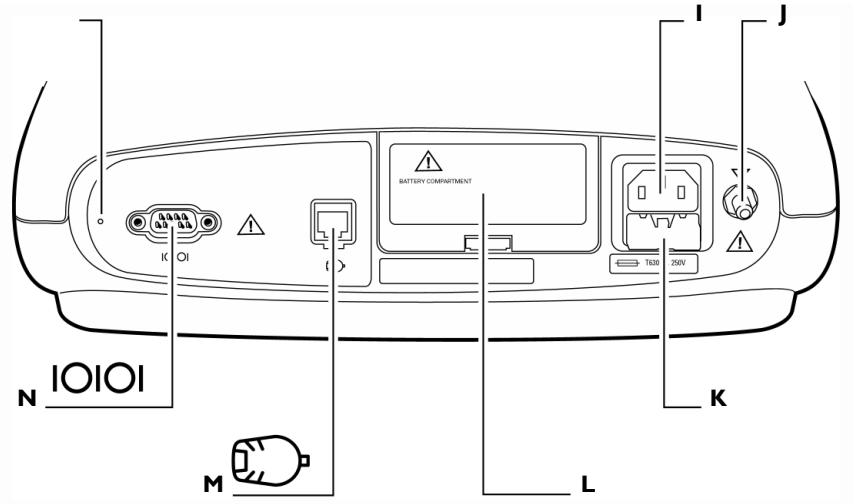
The following section shows front and rear views of the PageWriter Trim I cardiograph. For additional details, see the *PageWriter Trim Instructions for Use*.

Figure 1-1 PageWriter Trim I Cardiograph and Cart (Front View)



A Patient Interface Module (PIM)
B Printer paper/report storage slot
C Storage Shelf
D AC Power Cord
E PIM Leads
F Wheel Brake
G Control Panel
H Printer Paper Drawer

Figure 1-2 PageWriter Trim I Cardiograph (Rear View)



I AC Power Cord Connector

J Equipotential Post

K Fuse Door

L Battery Door

M PIM Connector

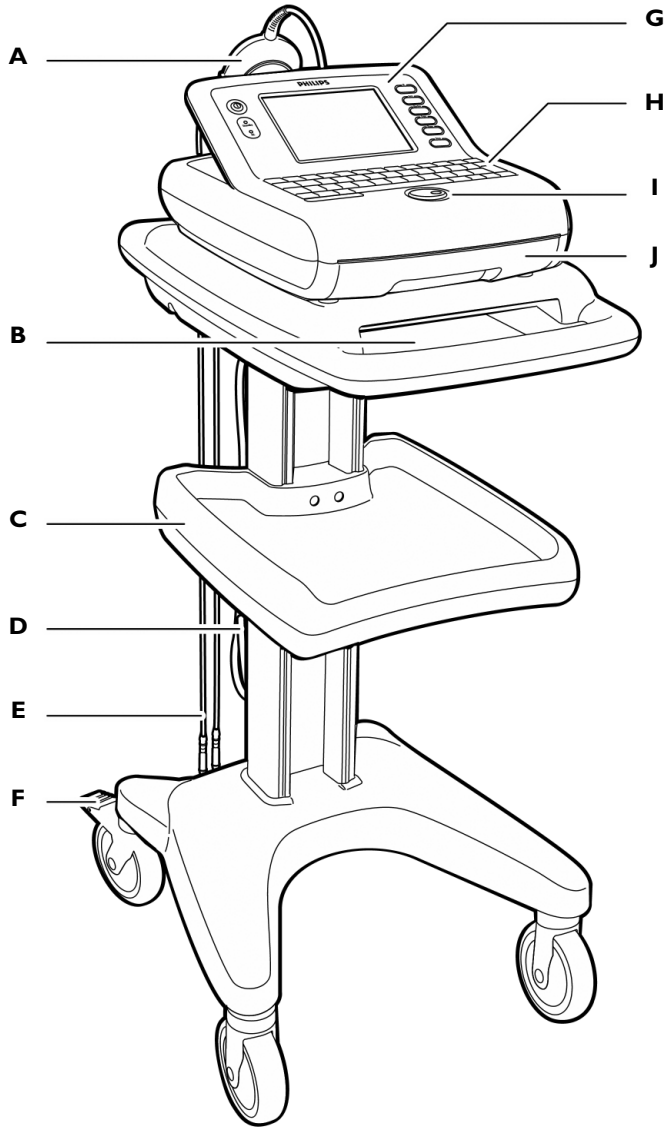
N Serial Connector (not supported)

WARNING **Do not connect a LAN cable connector to the PIM connector. Do not plug a telephone connector into the PIM connector.**

PageWriter Trim II, III, and Rx Cardiograph

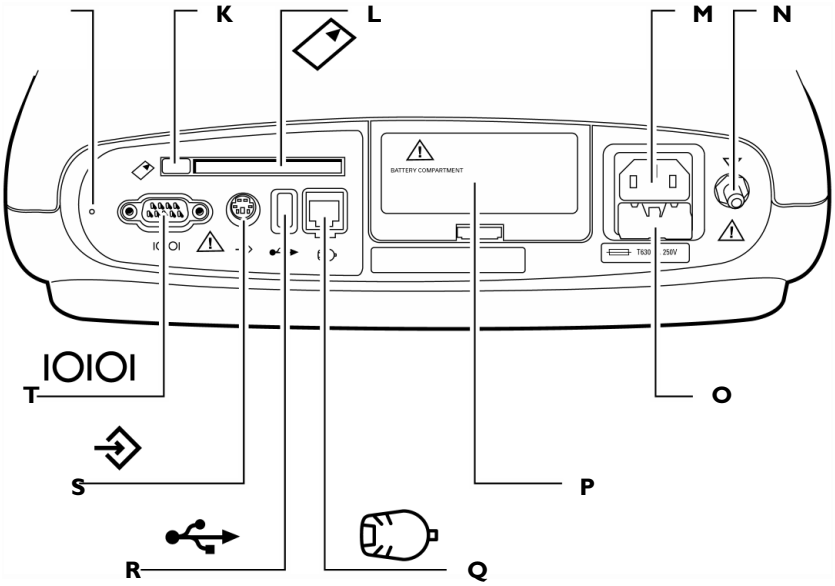
The following section shows front and rear views of the PageWriter Trim II, III and Rx cardiographs. For additional details, see the *PageWriter Trim Instructions for Use*.

Figure 1-3 PageWriter Trim II, III, and Rx Cardiograph and Cart (Front View)



A Patient Interface Module (PIM)
B Printer paper/report storage slot
C Storage Shelf
D AC Power Cord
E PIM Leads
F Wheel Brake
G Control Panel
H Keyboard
I Trim Knob
J Printer Paper Drawer

Figure 1-4 PageWriter Trim II, III, and Rx Cardiograph (Rear View)



K PC Card Eject Button

L PC Card Slot

M AC Power Connector

N Equipotential Post

O Fuse Door

P Battery Door

Q PIM Connector

R SmartCard Reader (USB) Connector

S Barcode Reader or Magnetic Card Reader Connector

T Serial Connector (not supported)

WARNING **Do not connect the LAN cable connector into the PIM connector. Do not plug a telephone connector into the PIM connector.**

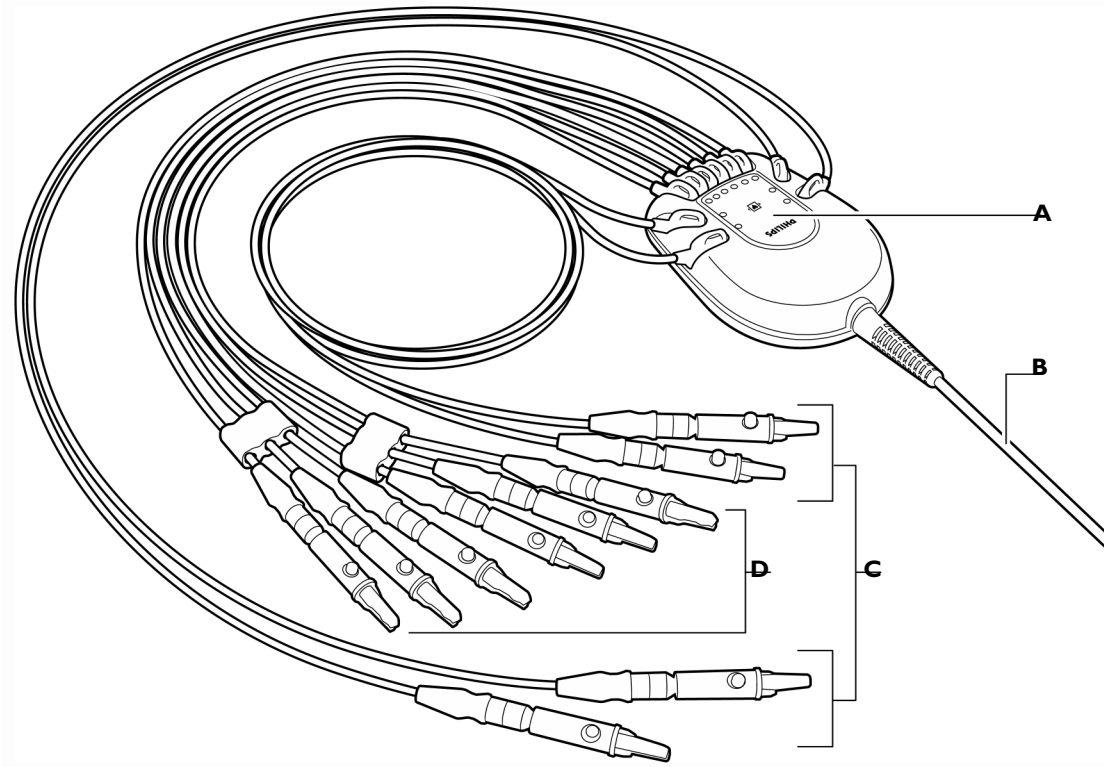
Patient Interface Module (PIM)

The Patient Interface Module (PIM) is a hand-held device that connects to the cardiograph. The lead wires on the PIM attach to the electrodes placed on the patient. The exterior of the PIM is labeled for quick and easy lead identification.

The PIM connects to the patient data cable and to the lead wires attached to the patient. See Figure 1-5 on the following page.

For details about connecting the lead wires to the PIM, see the *PageWriter Trim Instructions for Use*.

Figure 1-5 Patient Interface Module



A Lead Wire Labeling

B Patient Data Cable

C Limb Lead Wires

D Precordial (chest) Lead Wires

General Service Information

Keep the following points in mind when servicing this product.

Installation

The PageWriter Trim does not require installation by Philips field personnel. The cardiograph can be installed by the customer. The *PageWriter Trim Instructions for Use* describes the proper setup and configuration of the cardiograph and cart system.

Upgrades

Upgrades are available to add specific functionality to the device after purchase. These upgrades are:

989803129931	Add Bar Code Reader
989803129941	Add Magnetic Card Reader

989803129951	Add PCMCIA Network LAN card
989803129961	Add 'Smart' IC Card Reader
989803130061	PageWriter Trim Training CD
989803130081	PageWriter Trim Documentation CD
989803130091	Patient Module - AAMI
989803130101	Patient Module - IEC
989803130111	Cardiograph Cart - Basic
989803138021	Shielded LAN cable

Consult your sales representative, dealer, or distributor for the latest details.

Preventive Maintenance

The PageWriter Trim does not require scheduled preventive maintenance.

Preventive maintenance and periodic operational checks are intended to be performed by the user. Both topics are covered in the Cardiograph Care and Maintenance chapter of the *PageWriter Trim Instructions for Use* and this service manual. If further technical assistance is required, contact the nearest Philips Response Center. See "Contacting a Philips Response Center" on page 1-17.

Repair Philosophy

The repair philosophy of the PageWriter Trim Cardiograph is subassembly replacement. Examples of subassemblies are the print-head assembly, LCD, the main Processor Circuit Assembly (PCA), the power supply board, the power module, the printer drawer, etc. Replaceable subassemblies are identified in Chapter 7, “Parts and Accessories”. Only Philips authorized personnel can repair this product. Repairs by users that involve replacing subassemblies and components are not supported.

Ordering Supplies, Options and Accessories

These tables list the options and accessories available for the PageWriter Trim family of cardiographs, as well as ordering information for the supplies and accessories.

Country/Region Options

Country and region options includes the appropriate keyboard, power cord, printer paper, patient leads, and language. The following table shows the configuration for the country and region.

Table 1-1 Country/Region Option Configuration

Option	Country/ Region	Labels & User Doc.	Interp. Rpt	Keyboard	PIM/ Lead Version	Power Cord Opt.	Default Paper
AB0	Taiwan	Traditional Chinese	English	US English	AAMI	8120-5429	A
AB2	China	Simplified Chinese	Chinese	US English	IEC	8120-8376	A4
AB4	Singapore & Hong Kong	English	English	US English	AAMI	8120-1351	A4
AB9	Portugal	Portu-guese	Portu-guese	European	IEC	8120-1689	A4
ABA	USA/ Canada (English)	English	English	US English	AAMI	8120-5429	A
ABB	European English	English	English	US English	IEC	8120-1689	A4
ABC	Canada (French)	French	French	European	AAMI	8120-5429	A
ABD	Germany	German	German	European	IEC	8120-1689	A4
ABE	Spain	Spanish	Spanish	European	IEC	8120-1689	A4
ABF	France	French	French	French	IEC	8120-1689	A4
ABG	Australia	English	English	US English	AAMI	8120-4475	A4

Table 1-1 Country/Region Option Configuration *(continued)*

ABH	Nether-lands	Dutch	Dutch	US English	IEC	8120-1689	A4
ABM	Latin American	Spanish	Spanish	European	AAMI	8120-5429	A
ABU	UK	English	English	US English	IEC	8120-1351	A4
ABZ	Italy	Italian	Italian	European	IEC	8120-6978	A4
AC4	Brazil	Portu-guese	Portu-guese	European	AAMI	8120-5429	A
AC8	Argentina	Spanish	Spanish	European	AAMI	8120-6869	A
ACJ	India	English	English	US English	IEC	8120-4211	A4
AKJ	Israel & Gaza Strip	English	English	US English	IEC	8120-5182	A4
AKV	Chile & others	Spanish	Spanish	European	AAMI	8120-6978	A
AR0	Japan	Japanese	Japanese	Japanese	IEC	8120-4753	A4

Table 1-2 Options

Option	Description
A01	PageWriter Trim Cardiograph and Cart System
A02	PageWriter Trim Cardiograph only
C11	Lan Card
C12	Bar Code Reader
C13	Magnetic Card Reader
C14	‘Smart’ IC card reader
C15	Modem Card - U.S. and Canada only
C20	Interpretation (For Trim I only)
C30	PCMCIA Card ECG storage

Table 1-3 Documentation Part Numbers

Part Number	Description
	Quick Reference Card
	Getting Started Guide
	Instructions for Use
M4992-91905	Learning Products Folder

Standard Accessories

The standard accessories are based on model number and country/region options. See "Country/Region Options" on page 1-12. Accessories include:

- 100 sheets of z-fold paper
  - English paper p/n M3707A
  - Metric paper p/n M3708A
- Tab electrodes p/n 13943D
- Alligator clips
  - 989803129231 (AAMI)
  - 989803129241 (IEC)
- Quick Reference Card
- Getting Started Guide
- PageWriter Trim Learning Products Folder

Supplies and Ordering Information

The part numbers for all supplies for the PageWriter Trim cardiograph are listed in this section.

NOTE This section describes supply part numbers only. For repair part numbers, see Chapter 7, "Parts and Accessories".

You can order all supplies on the World Wide Web at

http://shop.medical.philips.com

Use the part numbers listed in this section for reference to ensure that the correct supplies are ordered.

Table 1-4 Complete Lead Sets

Part Number	Description
989803129161	Complete Lead Set (AAMI)
989803129191	Complete Lead Set (IEC)

Table 1-5 Replacement Lead Sets and Accessories

Part Number	Description
989803129141	Limb Lead Set, 99 cm/39 in (AAMI)
989803129151	Chest Lead Set, 61 cm/24 in (AAMI)
989803129171	Limb Lead Set, 99 cm/39 in (IEC)
989803129181	Chest Lead Set, 61 cm/24 in (IEC)
989803129201	Long Limb Lead Set, 137 cm/54 in (IEC)
989803129211	Long Chest Lead Set, 99 cm/39 in (IEC)
989803129221	Long Complete Lead Set (IEC)
989803129231	Alligator Clips for Disposable Tab Electrodes (AAMI)
989803129241	Alligator Clips for Disposable Tab Electrodes (IEC)

Table 1-6 Electrodes

Part Number	Description
13943B	Disposable cardiography electrode, resting diagnostic ECG
M2253A	Disposable electrode, adult, resting ECG (not available in Japan)
M2254A	Tab electrode adapter
40431B	Alligator Clip Adapter for 1/8 post
40498E	Snap Lead Electrode (IEC)
40475A	Snap Lead Electrode Adapter
40490E	15mm Suction Electrode
40421A	Push-in Connect Welsh Electrode
40494E	Limb Clamp Electrode C400 (4 per box)
40491E	Limb Plate Electrode C400 (4 per bag)
40424A	Limb Plate Electrode (4 pack)
14030A	Strap Electrode, 14 inch limb (4 per pack)
40420A	Disposable electrode, diagnostic, pre-gelled
13944B	Wet Gel Foal Electrode, resting ECG

Table 1-7 Printer Paper

Part Number	Description
M3707A	Thermal Paper (100 sheets), A size (8.5 x 11 in/21.6 x 28 cm)
M3708A	Thermal Paper (100 sheets), A4 size (8.27 x 11.69 in/21 x 29.69 cm)

Table 1-8 Battery

Part Number	Description
989803130151	Battery

Contacting a Philips Response Center

The Philips Response Center can assist with product troubleshooting and provide technical expertise to help with any issue with the PageWriter Trim cardiograph or any of its accessories.

For more information on the Philips Response Center go to

www.medical.philips.com/main/services/response_center

North America Response Centers

Country	Telephone Number
Canada	(800) 323 2280
United States	(800) 548-8833

Europe Response Centers

Country	Telephone Number
United Kingdom	07 002 432 58 472 or 07 002 HEALTHRC
Austria	01 25125 333
Belgium	32 2 525 7102 (French) 32 2 525 7103 (Flemish)
Finland	010 855 2455
France	0803 35 34 33
Germany	01850 475000
Italy	0800 8256087
Netherlands	31 4 027 876 30
Spain	34 90 2 304 050
Sweden	08 5064 8830
Switzerland	0800 80 10 23

Asia Pacific Response Centers

Country	Telephone Number
Australia	1800 251 400
China	800 810 0038
Hong Kong	852 2876 7578
Macau	0800 923
India	
New Delhi	011 2695 9734
Mumbai	022 5691 2643/2431
Calcutta	2485 3718
Chennai	044 555 01000
Bangalore	080 5091 911
Hyderabad	040 5578 7974
Japan	0120 381 557
Korea	080 372 7777 (toll free)
Seoul	02 3445 9010
Singapore	1800 Philips
New Zealand	0800 251 400
Philippines	02 845 7875
Malaysia	1800 886 188
Thailand	02 614 3569
Indonesia	021 794 7542
Taiwan	0800 005 616

Other Resources

For additional information on the PageWriter Trim cardiograph, see:

- *PageWriter Trim Cardiograph Getting Started Guide*
- *PageWriter Trim Instructions for Use*
- *PageWriter Trim Cardiograph Interactive Training Program*

2

Theory of Operation

This chapter provides functional descriptions of the components of the PageWriter Trim Cardiograph. These descriptions are at the functional-block level. This chapter also provides a system-level interconnection schematic, a data flow schematic, and a power-system block diagram.

This chapter is organized into the following sections:

System Overview. 2-1
Hardware Logical View. 2-2
High Level ECG Data Flow and Storage 2-4
Power System Overview 2-8
Power Management 2-10

Except as noted, the information in this chapter applies to the PageWriter II/III/Rx and the PageWriter I.

System Overview

The PageWriter Trim system performs acquisition, analysis, printing, storage, and transfer of ECG waveforms and other patient clinical data.

The PageWriter Trim Consists of three major subsystems:

- Main controller

  An Intel StrongArm-base single-board computer (SBC) with extensive I/O facilities, running Windows CE 4.1. The PageWriter Trim application software runs on the main controller, which includes the display and user-input subsystems.

- Print controller

  A Motorola Coldfire-based control circuit, embedded in the main controller board that provides all the real-time management of the printer. The print controller communicates with the main controller through USB.

- Patient Interface Module (PIM)

  An Intel StrongArm-based controller running Windows CE 4.1, coupled with a signal acquisition board employing Philips proprietary mixed-signal ASIC technology for ECG acquisition. The PIM communicates with the main controller through USB.

Hardware Logical View

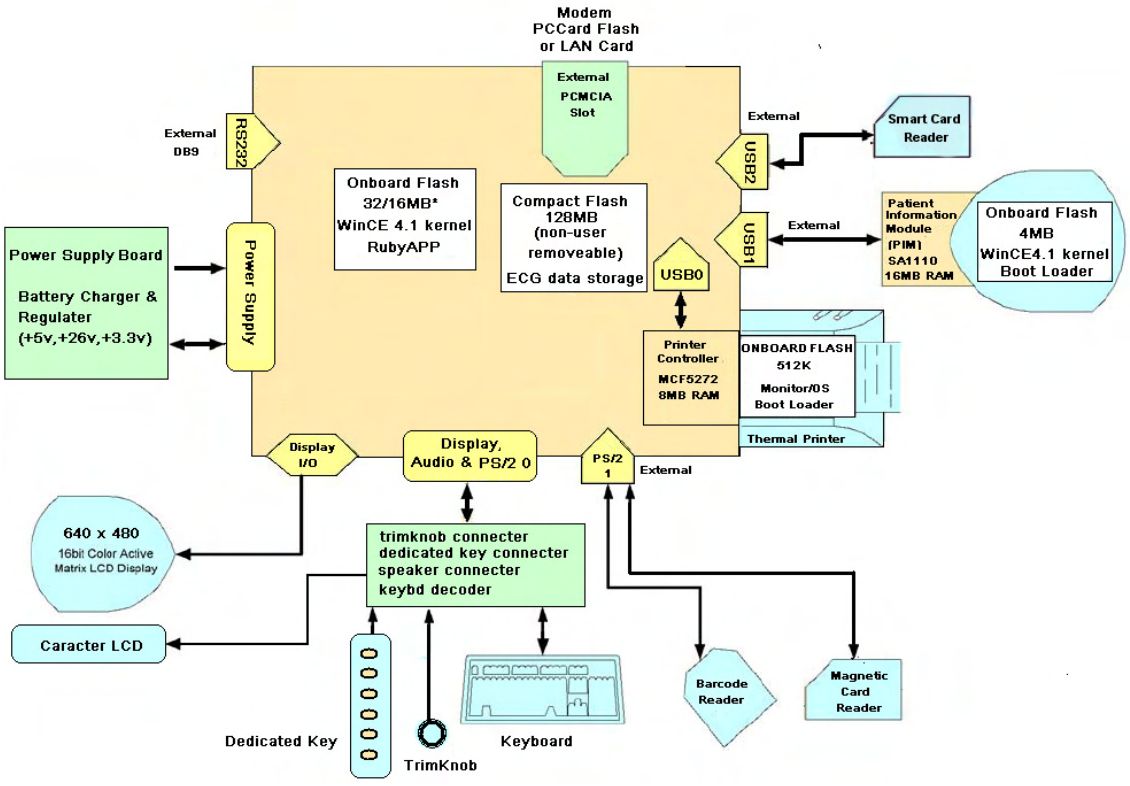
Control of the PageWriter Trim is provided by application software running on the main control board, interacting with numerous hardware and software subsystems. The following are high-level descriptions of these various subsystems.

Main Control Board

The main control SBC contains loader software and the Windows CE kernel image in its internal flash memory (32 MB for PageWriter Trim II/III/Rx, 16MB for PageWriter Trim I). At system boot, a system RAM test is performed by the loader (onboard RAM is 64MB), and then the Windows CE kernel loads. When Win CE loads, the application launcher runs, verifying system and executable images before loading the Ruby application. For PageWriter Trim II/III/Rx, all interaction with the operator is through the Ruby300_APP application. For PageWriter Trim I, all interaction with the operator is through the Ruby100_APP application. The application software is stored in internal Flash memory. For PageWriter Trim II/III/Rx, ECG archives are stored on a separate 128MB CompactFlash (CF) card installed in the main control board.

The following shows devices and interfaces provided by the main control board.

Figure 2-1 Devices and Interfaces for Main Control Board



The board presents a backplane through the back of the PageWriter Trim case, allowing the user to access interfaces labeled as *external* above, along with the PCMCIA slot, and the PS/2 connection for a barcode reader device.

Display

The PageWriter Trim II/III/Rx display is 640 x 480 pixels, up to 64 color TFT LCD with backlight. All display functions are handled by the main control board using the S1D13506 (EPSON) graphics accelerator chip.

The PageWriter Trim I display is a 40 x 2 Line Character LCD with cursor. Its function is driven directly by SA1110.

Patient Interface Module (PIM)

The PIM is a SA1110-based WinCE subsystem, which is connected by USB to the main control board. It provides real-time data acquisition of ECG signal from an electrode connected patient.

Printer Control (USB)

All data printing is handled by the Main Board. The printer control is a Motorola Coldfire processor-based control circuit. It provides ECG waveform rendering and basic bitmap imaging operations, and uses a PCL-like control language API for page description and feed control.

Battery (Lead-Acid)

The battery is a lead-acid 12 volt unit, providing 2.9 Amp-Hours of current when fully charged.

Keyboard/Trim Knob (PS/2)

The PageWriter Trim II/III/Rx cardiograph includes a laptop-format, PS/2, sealed, full key action keyboard, a Trim Knob as a pointing device for easy navigation, and six dedicated keys. It includes a keyboard matrix, Trim Knob decoder, and daughter board, which provides language-specific keyboard support and decoding via PS/2 and standard WinCE device drivers for key and Trim Knob input into PageWriter Trim. Powered by PS/2 connection.

The PageWriter Trim I cardiograph includes six dedicated keys and a Trim Knob. The dedicated keys and the Trim Knob interface to the Main Board via the PS/2 port.

Magnetic Card Reader (PS/2)

A magnetic card reader is available as an option. It connects through an external PS/2 connector and provides ISO and standard encoded magnetic strip support. Manual removal and insertion is required.

NOTE The PS/2 port is not a plug-and-play port. You must attach the barcode reader to the port before powering on the unit.

Barcode Reader (PS/2)

A barcode scanner is available as an option. It connects through an external PS/2 connector and provides standard barcode scanning capability. It emulates a keyboard, allowing scanned codes to be presented to the PageWriter Trim cardiograph as if they had been typed on the standard keyboard, powered by PS/2 connection. The barcode reader can be configured using special barcodes.

NOTE The PS/2 port is not a plug-and-play port. You must attach the barcode reader to the port before powering on the unit.

Smart Card Reader

A smart card reader is available as an option. It connects through an external USB connector and provides standard smart card reading capability. PageWriter Trim cardiograph uses the smart card reader to get patient information.

PCMCIA LAN Card

A PCMCIA LAN Card is available as an option. It connects through the PCMCIA slot and provides standard LAN capability. The PageWriter Trim cardiograph communicates with the TraceMaster ECG Management System through the PCMCIA LAN Card.

PCMCIA Modem Card

A PCMCIA modem card is available as an option. It connects through the PCMCIA slot and provides standard modem capability. PageWriter Trim faxes ECG data to remote receivers or communicates with TraceMaster ECG Management System through the PCMCIA modem card.

High Level ECG Data Flow and Storage

General ECG flow begins with acquisition by the Patient Interface Module (PIM) from electrodes placed on a patient. Data is streamed real-time to the main control board, where it is received into the application buffers in RAM. These buffers are used to present the signal data on the real-time screen. When the user initiates an auto report print, corresponding 10-second segments of the signal data are then copied to the temporary ECG storage memory in RAM.

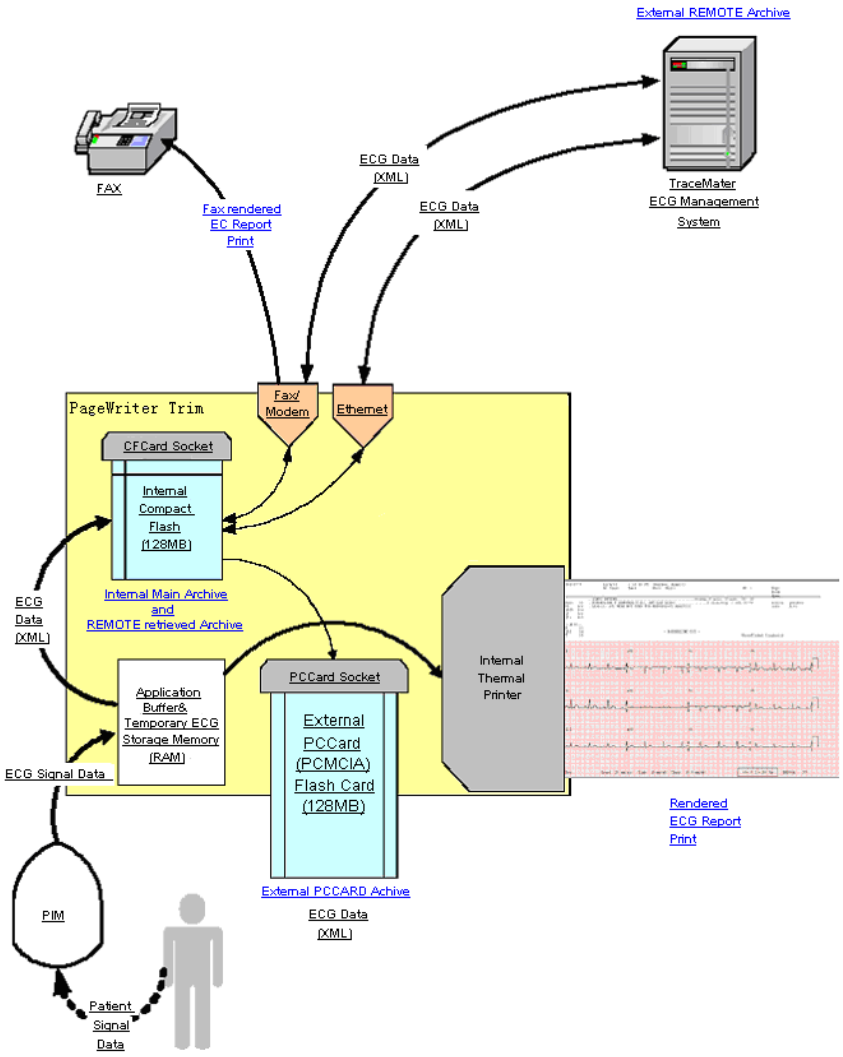
These 10-second segments are named ECG reports that can be previewed and printed. In the case of Auto mode, the ECG report is automatically printed. An ECG report contains signal data, analysis information, patient demographics, and acquisition information, along with operator and device information. See the PageWriter Trim XML documentation for a complete description of the contents of the ECG data record.

If automatic save after print is set, the ECG report is saved in XML format to the internal main archive. This archive is non-volatile and resides on the internal CompactFlash (CF) card. Index files with a CDB extension are also maintained in this archive.

From the internal main archive, the ECG XML data format files can be copied, deleted, previewed, printed, and transferred to other devices. The internal main archive cannot receive ECG XML files from external devices. Retrieved ECG file storage is limited to the internal remote archive.

NOTE PageWriter Trim-generated ECG XML files comply with the Philips Medical Systems ECG XML Schema version. They incorporate an embedded CRC32 value, which is used to ensure the data integrity of the file.

Figure 2-2 ECG Flow and Storage



Internal Main Archive

The internal main archive resides on the internal CompactFlash (CF) card, and is used as the primary ECG data repository. ECG XML files and related index files are stored here in the RubyArchiveInternal directory. All stored ECG files transition through this archive prior to transfer or copying to other devices, such as the PC card.

Currently, the internal main archive is limited to storing the following maximum number of ECGs.

Table 2-1 Maximum Number of ECGs Stored (Internal Main Archive)

Model	Maximum Number of ECGs Stored
Trim Rx	200
Trim III	150
Trim II	50

Internal Remote Archive

The internal remote archive resides on the internal CompactFlash (CF) card much like the internal main archive. All XML files retrieved from remote sites, such as the TraceMaster ECG Management system, reside in this archive until deleted. ECG XML files and related index files are stored in the RubyArchiveRemote directory.

Currently, the internal remote archive is limited to a maximum of 100 ECGs.

External PC Card Archives

The external PC card archives reside on a compatible PC card inserted into the PC card slot. Files may then be transferred to inserted cards using the Archive mode features of the PageWriter Trim, and are stored as an XML format. An index file is created and maintained on each PC card when CDB files are transferred or copied from the card. Currently, an external PC card archive is limited to storing the following maximum number of ECGs.

Table 2-2 Maximum Number of ECGs Stored (External PC Card)

Model	Maximum Number of ECGs Stored
Trim Rx	200
Trim II/III	150

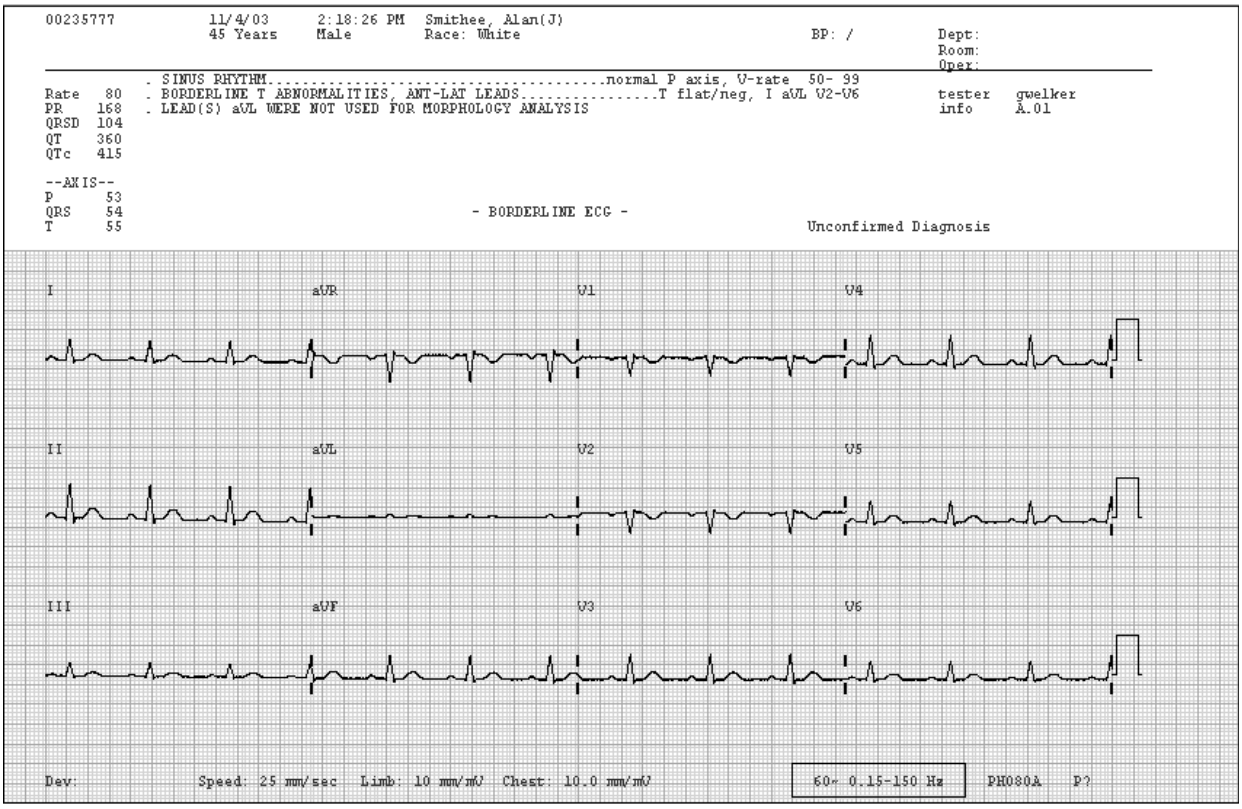
NOTE When you add or delete compatible ECG XML files from a PC card (not using the PageWriter Trim), it is recommended that you delete all CDB files prior to reinserting the PC card into the PageWriter Trim. In the absence of an index file, the PageWriter Trim automatically regenerates the index based on the XML files on the PC card.

Rendered ECG Report Prints

A rendered ECG report print is a representation of the ECG data. This includes a high-resolution print of the signal data, and may include configured patient demographics, acquisition information, and other non-signal data elements.

The PageWriter Trim allows the user to customize the fields on an ECG report print. The report print may consist of one or more continuous pages on perforated thermal media from the printer.

Figure 2-3 Rendered ECG Report Print Sample



Fax-Rendered ECG Report Print

A fax-rendered ECG report print is equivalent to the rendered ECG report print, as described in the previous section, except it has been adjusted to comply with fax transmission and resolution device requirements. When the user starts a fax transfer, the ECG report is rendered and transmitted to a remote fax site pre-configured into the unit, using the optional fax and modem PC card. The fax-rendered ECG report print may be stored on the received system end as an electronic file, and not actually used to produce a printed copy.

Power System Overview

The PageWriter Trim power system consists of:

- A 65-watt AC/DC medical grade power module
- One 12 volt, 2.9 amp-hour lead-acid rechargeable battery
- A power supply board which includes battery charging circuitry, various voltage regulators, and logic circuitry to provide for battery operation

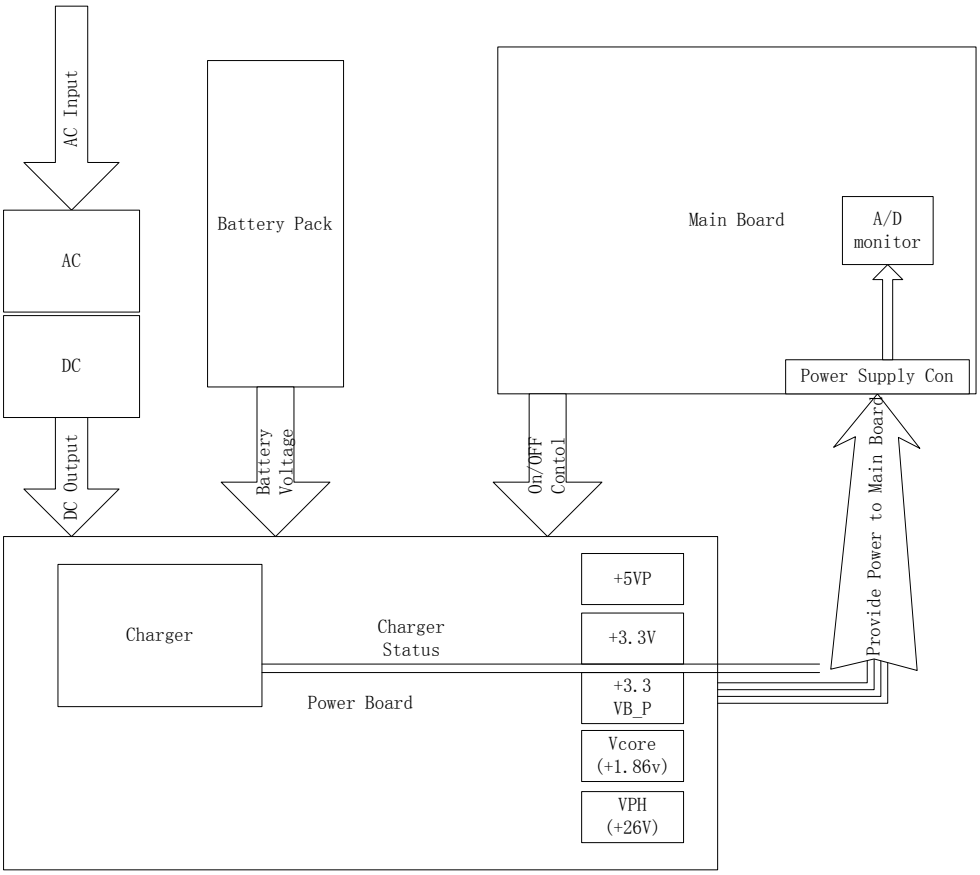
The PageWriter Trim is designed to run primarily on battery power, using the AC power for recharging. The power board has a battery charging chip to control the battery charging. The main board has an A/D converter to monitor voltage of every power supply and a Board Status Register (BSR) to monitor the battery charging status.

The major power draws within the PageWriter Trim are the LCD display backlights, which can draw up to 4 watts, and the thermal printer, which can draw about 48 watts. Provisions have been incorporated into the PageWriter Trim to allow the user to modify the display brightness. To extend battery life, set the display brightness to low or medium level. Also, activate the power save mode (dims the screen) to further extend battery life. The printer control board is current limited for normal printing. However, if print demand is too high, the current limiter will not print the output, resulting in a faded page.

Battery

The 12V recharged sealed lead-acid battery provides the power to the PageWriter Trim. The battery provides a high-current discharge as needed for thermal printing. Built-in protection circuitry in each pack prevents damage to the battery by overcharging, over discharging, over current, and over temperature.

Figure 2-4 Power System Block Diagram



Power Labels

The following represent the various power labels used in the PageWriter Trim.

Vin

The DC voltage direct from the AC power. The voltage level is between 17.10V and 18.90V, with a maximum power output of 65 watts. This voltage is monitored.

VB+_T (Battery information)

The battery voltage range is between 10.0V and 14.8V. Discharge current is limited to a continuous 2.9 amps, with a 4.0 amp limit for short periods. This voltage is monitored.

VO

The voltage will be supplied by Vin and battery. Its range is between 10.0V to 18.90V. The voltage is monitored.

+3.3V

Output from the U113 (power board) regulator. This switching regulator will supply 3.3V at up to 4.25A of current. This voltage is monitored.

+3.3VB_P

Output from U111 (power board) regulator, an MIC5233, for the real timer and power sequence circuit. The voltage level is 3.3V, and can provide up to 100mA of current. This voltage is not monitored.

VDDX

Output from +3.3V through a π filter, which is the primary power for the main system processors and memory. The voltage level is 3.3V. This voltage is monitored.

Vcore (+1.86V)

Output from the U105 (power board) circuit, an LTC1627, which is 1.86V core power for the main system processor. The input to this regulator is from the 3.3V supply, and can supply up to 500mA of current. This voltage is monitored.

+5VP

Output from the U101(power board) circuit, an LTC1374, which supplies all the 5.00V power to the system. Input is from V0, and output is 5.00V with a maximum current of 4A. This voltage is monitored.

USB_VCC

Output from the U303 (main board) circuit, an MIC2503, which supplies the barcode scanner and other external USB device. Input is from +5V, and output is +5V with maximum current of 500mA. This voltage is monitored.

VPH

Output from the U108 (power board) circuit, an LM2588, which supplies +26V power to the printhead. It is controlled by printer MCU, MCF5272, which is located on main board. VPH provides power only when a print session starts. Otherwise, VPH does not provide power. This voltage is monitored by MCF5272.

Power Management

Battery Charging Logic

The system host processor controls several functions of the power system. These include:

- Activating sleep mode if no activity is detected for a preset period of time.
- Restricting the user from printing when the charge capacity reaches preset levels.

- Alerting the user when maintenance is needed for the battery.

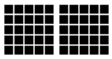
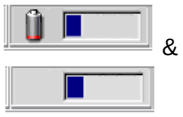
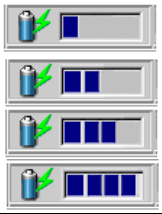
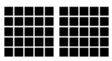
Battery Gauge

The battery gauge on the PageWriter Trim II/III/Rx LCD display consists of four segments. When the battery is fully charged, all four segments are displayed.

The battery gauge on the PageWriter Trim I LCD display consists of two icons. It shows in the upper right corner of the LCD.

The following table shows the different battery status readings.

Table 2-1 Battery Status Readings

Battery Level	Bars (Trim II/III/Rx)	Icons (Trim I)
Full Charge battery		
75%		
50%		
Low Battery		
Flashing Low Battery	Flashing 	Flashing &
No or Dead Battery		
Battery is charging	Moving bar 	Flashing & 

Battery Discharging

When the battery is discharged to the 30% level, the PageWriter Trim disables high-demand printing, and continues to allow the battery to be discharged to a 20% level. When the 20% level is reached, the PageWriter Trim disables printing, and warns the user to plug in the AC power cord. If the AC power cord is not plugged in within three minutes, the PageWriter Trim automatically shuts down.

Battery Charging

When the AC power cord is plugged in, the battery begins to charge. Check the charging status on the Board Status Register (BSR).

Charge Current

When the unit is in operating mode, the charge current is 580mA. When the unit is in sleep mode, the charge current depends on the battery. The initial charge is approximately 580mA in bulk charger status. When the voltage is up to approximately 14.6V, the current is slowly reduced to approximately 100mA over time as it enters floating charging.

Battery Information

Battery information is sent from the battery charger, UC3909. This information is then sent up to the host processor via BSR, and can be viewed from the Service Utility screen.

3

Cardiograph Care and Maintenance

This chapter contains information on basic cardiograph care and periodic maintenance. If further technical assistance is required, contact the nearest Philips Response Center (see page 1-17). The PageWriter Trim does not require scheduled preventive maintenance. Basic cleaning and maintenance guidelines are also included in the Maintenance chapter of the *PageWriter Trim Cardiograph Instructions for Use*.

This chapter is organized as follows:

Cleaning the Cardiograph 3-1
Cleaning the Print Head 3-3
Replacing the Printer Paper 3-3
Battery Maintenance and Care 3-4
Replacing the Lead Wires in the PIM 3-6
Cardiograph and Accessory Disposal 3-7
Setting the Date and Time 3-7
Maintenance Tests 3-9

Cleaning the Cardiograph

To clean the cardiograph

1. Unplug the AC power cord.
2. Wipe the external surfaces of the cardiograph with a soft cloth dampened in any of the approved cleaning solutions listed below.

CAUTION When cleaning, avoid the lead wire connectors and patient data cable connectors.

Approved Cleaning Solutions

- Mild soap and water
- Isopropyl alcohol

CAUTION **Do not** use strong solvents or abrasive cleaning materials.

Do not spill liquids on the surface of the cardiograph.

Do not use any of the following to clean the cardiograph:

- Acetone
- Iodine-based cleaners
- Phenol-based cleaners
- Ethylene oxide sterilization
- Chlorine bleach
- Ammonia-based cleaners

The cardiograph or PIM should not be autoclaved, ultrasonically cleaned, or immersed,

Cleaning the PIM, Patient Data Cable, and Lead Wires

CAUTION **Do not:**

- Use isopropyl alcohol
- Autoclave the patient data cable or lead wires or use ultrasonic cleaners
- Immerse
- Use abrasive materials
- Wet the connectors

To clean the PIM, patient data cable, and lead wires

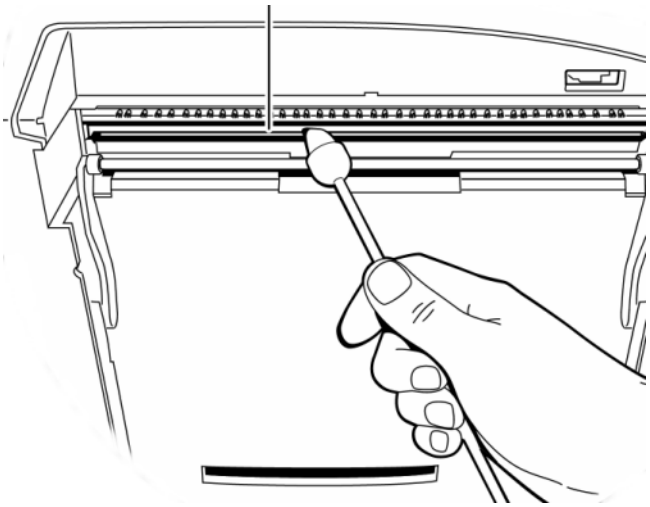
1. Dampen a soft cloth with soapy water or with one of the disinfectants or cleaning agents listed below. Clean patient data cable and lead wires with any of the following:
   - Cidex Ortho Phthaladehyde
   - Cetylcide
   - Vesphene 2 Aqueous Phenolic Germicidal Agent
2. Wring excess moisture from the cloth before cleaning.

Cleaning the Print Head

A dirty print head may cause poor or uneven print quality.

TIP Clean the print head more frequently when printing large volumes of ECGs.

Figure 3-1 Paper Drawer and Print Head



To clean the print head

1. Pull the paper drawer completely out from the front of the cardiograph.
2. Turn the unit over.
3. Wipe the print head lightly with a foam swab dipped in 90% alcohol.
4. Allow the print head to dry.

Replacing Printer Paper

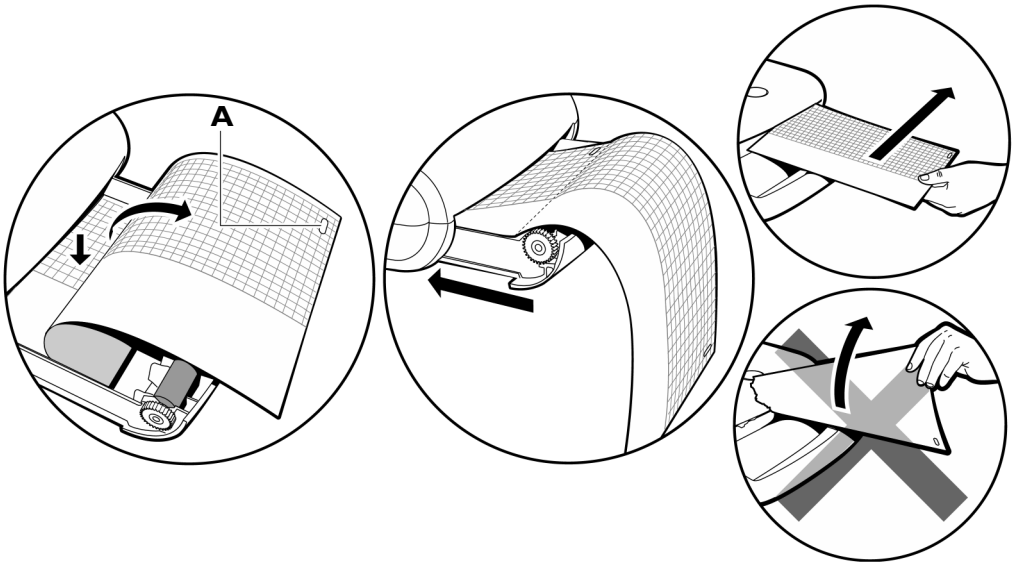
Replace the printer paper when a red stripe appears on the printed ECG report. Only use Philips Medical Systems replacement printer paper. For part number and ordering information, see page 1-16.

- Always load less than 100 sheets of printer paper into the paper tray
- Ensure that the entire first page of the new paper roll is fully draped over the roller before closing the printer door

PageWriter Trim II and III:

- Ensure that the paper size configured for the cardiograph is the same size paper being loaded into the paper drawer.

Figure 3-2 Changing Printer Paper



A Paper sensor hole

To change the printer paper:

1. Open the paper drawer on the front of the cardiograph and remove any remaining sheets.
2. Insert a new pack of printer paper with the printed side facing up. Ensure that no more than 100 sheets are being inserted into the paper tray.
3. Ensure that the paper sensor hole (**A**) is positioned as shown in Figure 3-2.
4. Drape the entire first sheet over the roller. Ensure that the perforated edge of the paper aligns with the edge of the paper drawer.
5. Close the paper drawer.
6. Tear off the first sheet as shown in Figure 3-2.

Battery Maintenance and Care

Caring for the Battery

The battery must be installed for proper operation of the cardiograph. The cardiograph cannot print an ECG report without the battery, even if it is plugged into AC power. For information about removing or replacing the battery, see Chapter 6, “Removing and Replacing Cardiograph Components”.

The sealed lead-acid battery used in the PageWriter Trim family of cardiographs will provide optimum life when the unit is continuously connected to AC power and fully charged after each use. A depleted battery requires 16 hours of continuous charge time to fully charge. Because it is not always possible to allow a full charge cycle between uses, the cardiograph was designed to charge a depleted battery to 90% of its capacity in approximately eight hours.

CAUTION Repeated undercharging of the battery will damage the battery and reduce battery life.

NOTE Philips recommends that the cardiograph be plugged into AC power whenever possible to maximize battery life.

Battery life varies depending on frequency of use and maintenance. For improved battery life, keep the cardiograph plugged in when not in use. If the battery has been fully charged and requires recharging after a few ECGs, consider replacing it.

For optimal battery performance:

- Only use Philips Medical Systems lead-acid battery (Philips part number 989803130151 with the cardiograph.
- Keep the cardiograph plugged in when not in use.
- If the battery has been fully charged and requires recharging after a few ECGs, consider replacing it.
- The use of cardiograph accessories (bar code reader, magnetic card reader, PC card, modem) will deplete battery power at a faster rate. The battery will require more frequent charging if these accessories are used with the cardiograph.

NOTE The battery should be removed from the unit and placed in storage if the cardiograph will not be used for more than one month.

Storing the Battery

Remove the battery from the cardiograph if it will be stored for more than 30 days without use. While in storage, the battery will require a full recharge every 6 months. Charge the battery for at least 16 hours. This will ensure that the battery does not completely discharge while in storage. The battery life will be prolonged when stored in cooler temperatures, but will be damaged if stored below freezing (0 °C/32°F). Store the battery at a temperature of 40 °C (104° F) or lower.

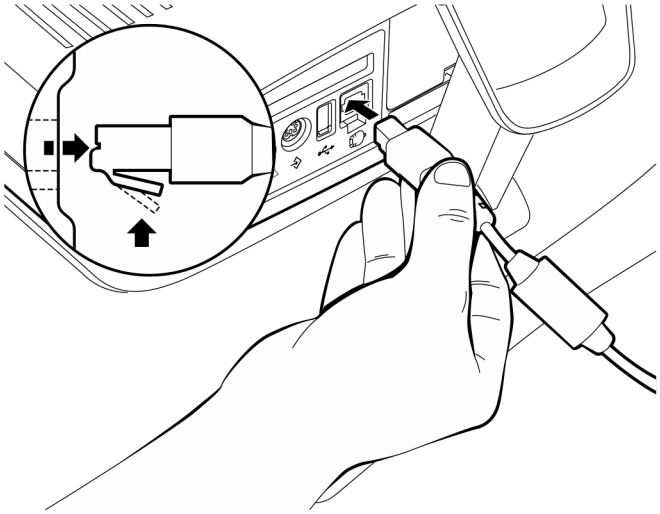
To store the battery:

1. Charge the battery for 16 hours before removing it from the cardiograph. Ensure that the AC power cord is connected to the cardiograph and is plugged into a grounded AC power outlet. Check that the green AC power indicator light on the front of the cardiograph is lit.
2. Remove the battery from the cardiograph and store it in a cool, dry location. For information about removing or replacing the battery, see Chapter 6, “Removing and Replacing Cardiograph Components”.
3. Recharge the battery for 16 hours for every 6 months that the battery is in storage.

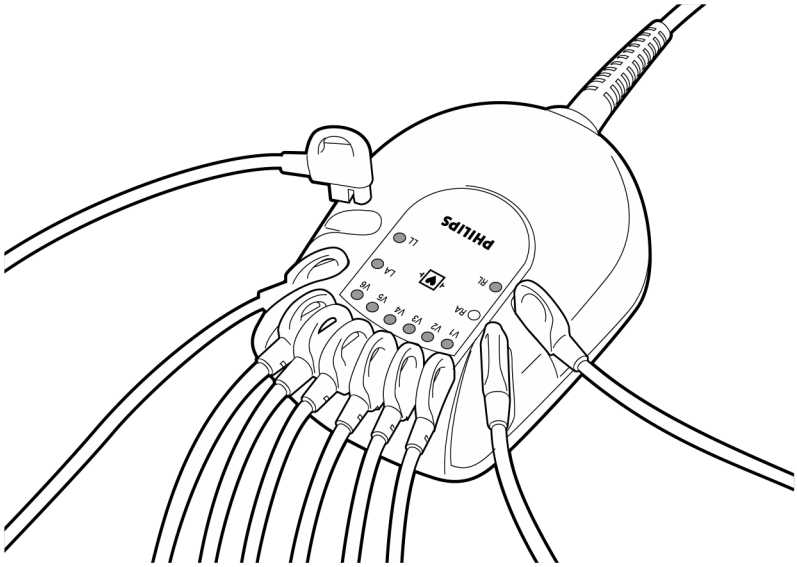
Replacing the Lead Wires in the PIM

To replace the lead wires

1 Disconnect the PIM from the RJ-11 receptacle (rear of cardiograph).

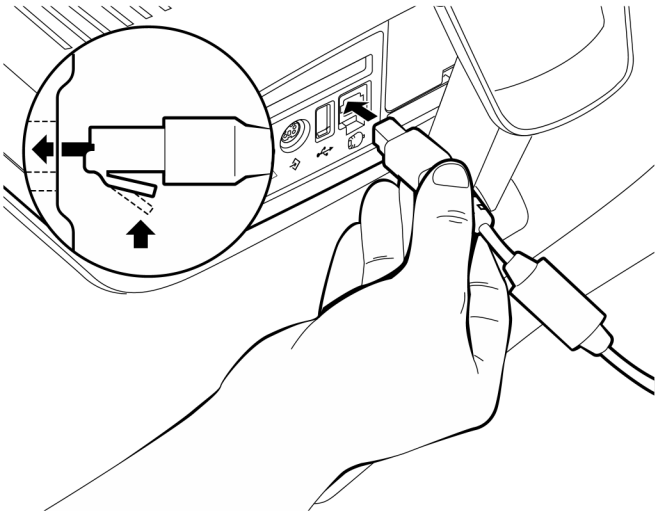


2 Remove the lead wire(s) by pulling the connector up.



3 Match the lead wire labeling (on lead) with the same lead wire connector on the PIM. Replace the lead wire by snapping it into the connector.

4 Reattach the patient data cable to the RJ-11 receptacle (rear of cardiograph).



WARNING **To ensure safety and prevent damage to the system, only connect the patient data cable to the correct PIM connector on the rear of the cardiograph.**

Cardiograph and Accessory Disposal

When the cardiograph has reached the end of its product life, dispose of it according to local ordinance. When any of the cardiograph accessories reach the end of their product life, dispose of these items in accordance with manufacturer instructions and local ordinances.

Setting the Date and Time

PageWriter Trim II/III/Rx

To change the date and time

1 Turn the Trim Knob and select the **Config** button on the Command Toolbar.

2 Push the Trim Knob. The Configuration screens appear.

3 Hold down the Alt key on the keyboard.

4 Press the L key. The Locale screen appears.

5 The **Year:** drop-down list is highlighted. Push the Trim Knob to display the drop-down list.

6 Turn the Trim Knob to highlight the current year.

7 Repeat the procedure to set the current **Month**, **Day**, **Hour**, **Minute**, and **Second**.

NOTE The **Hour:** is set on a 24-hour clock. If the **Regional Settings** are set to display a 12-hour clock, the cardiograph will display the time based on the 12-hour clock setting.

8 Turn the Trim Knob to highlight the **Apply Changes** button.

9 Push the Trim Knob to apply the new date and time settings.

To change regional settings

1 Turn the Trim Knob until the **Region** drop-down list under **Regional Settings** is highlighted.

2 Push the Trim Knob to display the drop-down list of available regional settings.

NOTE The **Regional Settings** only change the displayed time, date, and decimal formats.

3 Push the Trim Knob to select a regional setting. The regional settings appear on the screen.

To change the units system

1 Turn the Trim Knob to highlight a setting under **Units System**.

2 Turn the Trim Knob to highlight **Metric** or **English**.

3 Push the Trim Knob to select the setting.

Press *Enter* (on the keyboard) to save the changes and exit the Configuration screen. The new changes are applied.

PageWriter Trim I

To change the date and time

1 Turn the Trim Knob until the date is highlighted.

2 Press the Trim Knob. A new screen appears showing the current date and time settings.

3 Turn the Trim Knob until the field you want to change is highlighted.

4 Press the Trim Knob to select the field.

5 Turn the Trim Knob to scroll through the options for that field.

6 Push the Trim Knob to select a setting.

7 Repeat the procedure to set the current **Month**, **Day, Year, Hour**, **Minute**, and **Second**.

8 When all settings are complete, turn the Trim Knob to highlight the arrow icon (🡐).

9 Push the Trim Knob to save the settings and to exit the screen.

Maintenance Tests (Trim II/III/Rx)

To verify or optimize cardiograph performance, use the diagnostic utilities and maintenance tests. From the operation mode, you can use the tests listed below as a first step in identifying a technical problem.

.

To open the Diagnostics/Maintenance Test screen

1. Turn the Trim Knob to highlight the **Config** button on the Command Toolbar.
2. Push the Trim Knob to select the button. The Configuration screen appears.
3. Select **System** by holding down the *ALT* key and selecting **S** on the Configuration Screen. The **Diagnostics** section of the screen lists the five maintenance tests.

Appendix B, “Maintenance Tests” provides instructions for each test. Refer to the page numbers in the list below to locate the tests you need to perform.

Test	Page
PIM Test	B-2
Barcode Test	B-2
Magcard Test	B-3
Printer Test	B-3
Network Test	B-5

4

Troubleshooting

This chapter provides information for localizing cardiograph problems to the subassembly level. This information is designed for use with the cardiograph's diagnostic self-tests to help you efficiently repair the cardiograph with a minimum of equipment.

This chapter provides the following information:

Power On and Power Off Sequence 4-2
Troubleshooting Cardiograph Issues. 4-4
Display Issues 4-4
Keyboard/Trim Knob/Dedicated Key Issues 4-6
Signal Acquisition Issues 4-7
Real Time Screen Issues 4-8
Archive Screen Issues 4-8
Printer Issues 4-11
PC Card Issues. 4-13

Power On and Power Off Sequence

The following sequence of events occur during a normal warm or cold cardiograph boot.

Figure 4-3 Power On Sequence

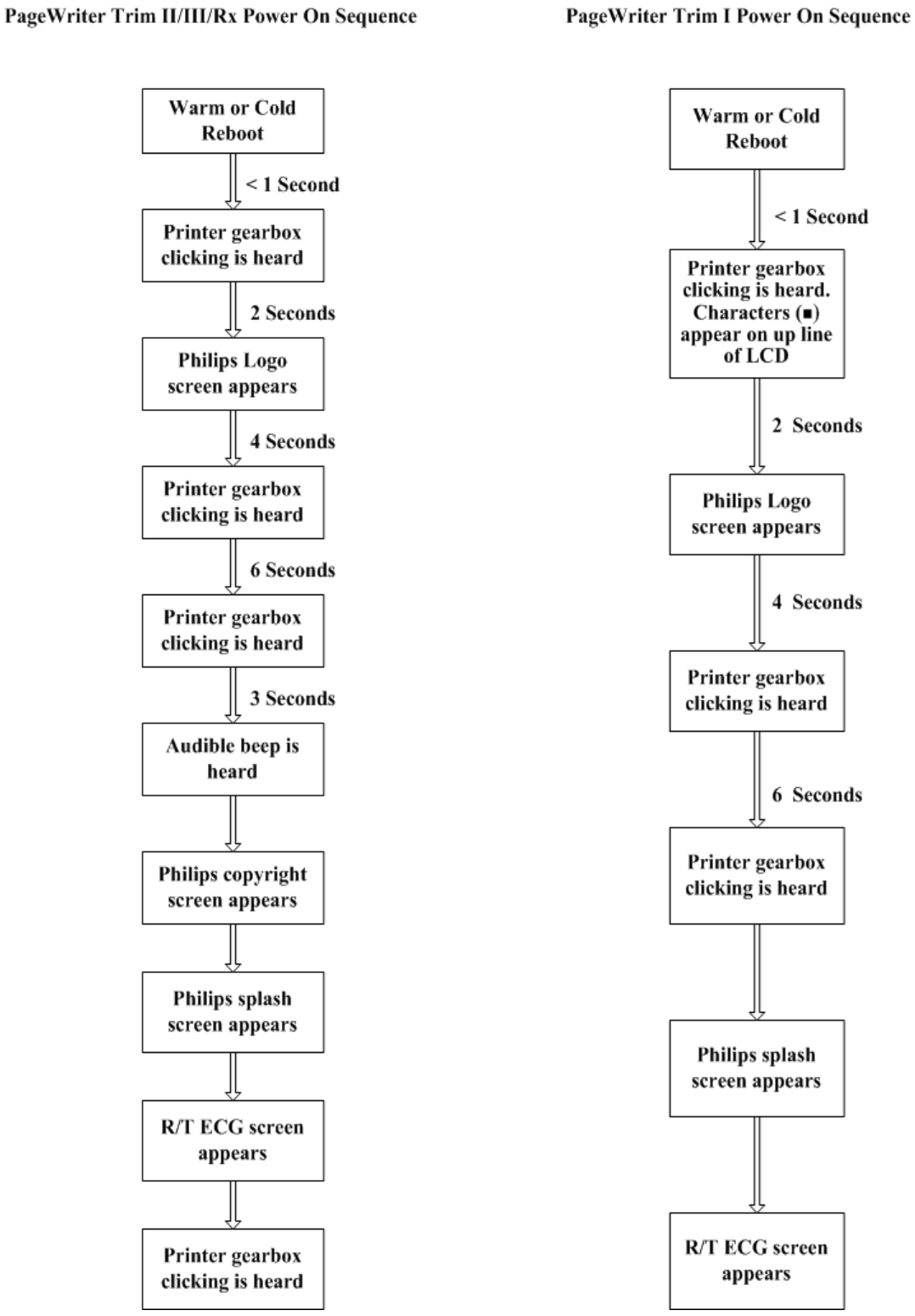
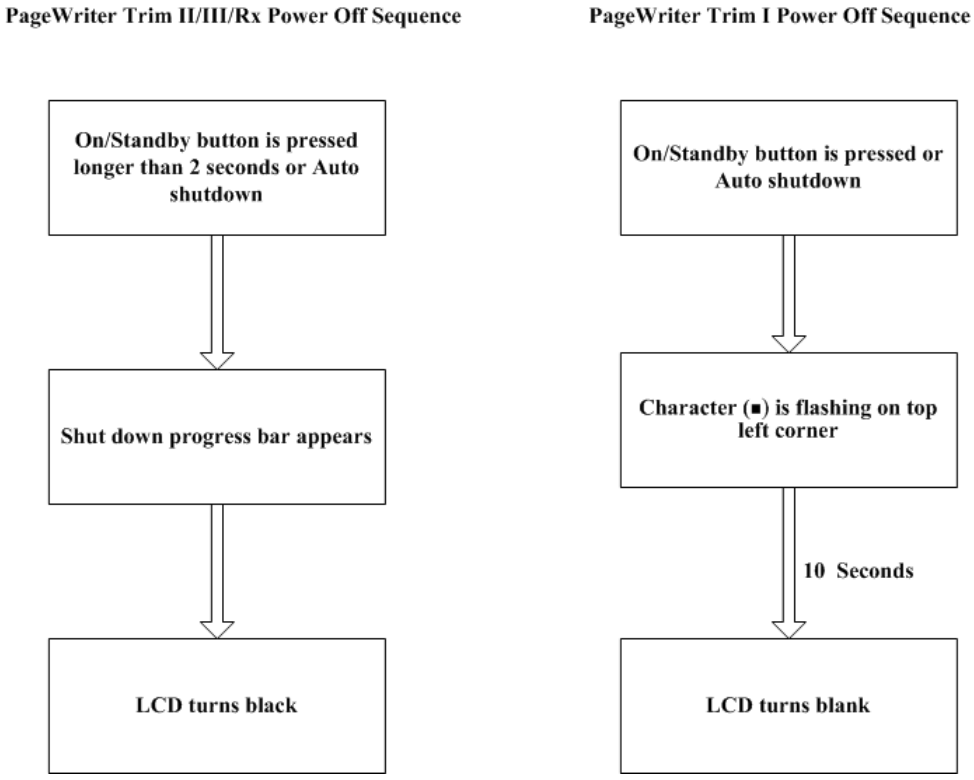

PageWriter Trim II/III/Rx Power On Sequence
Warm or Cold Reboot
< 1 Second
Printer gearbox clicking is heard
2 Seconds
Philips Logo screen appears
4 Seconds
Printer gearbox clicking is heard
6 Seconds
Printer gearbox clicking is heard
3 Seconds
Audible beep is heard
Philips copyright screen appears
Philips splash screen appears
R/T ECG screen appears
Printer gearbox clicking is heard
PageWriter Trim I Power On Sequence
Warm or Cold Reboot
< 1 Second
Printer gearbox clicking is heard. Characters (■) appear on up line of LCD
2 Seconds
Philips Logo screen appears
4 Seconds
Printer gearbox clicking is heard
6 Seconds
Printer gearbox clicking is heard
Philips splash screen appears
R/T ECG screen appears

Figure 4-4 Power Off Sequence


PageWriter Trim II/III/Rx Power Off Sequence
On/Standby button is pressed longer than 2 seconds or Auto shutdown
Shut down progress bar appears
LCD turns black
PageWriter Trim I Power Off Sequence
On/Standby button is pressed or Auto shutdown
Character (■) is flashing on top left corner
10 Seconds
LCD turns blank

Troubleshooting Cardiograph Issues

The troubleshooting tables in this section help you to localize a fault and correct it.

The following charts list symptoms and the steps to follow to investigate and solve the problem. Most steps can be performed without opening the unit. Several failure mode symptoms may actually be hardware induced or triggered, and may require board replacement or opening of the unit for inspection.

Display Issues

Table 4-1 Display Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Screen is dark and shows no image	Unit is in standby **Action:** Press the On/ Standby button on the front display.	Confirm the unit wakes up.	User training on proper use of unit's standby mode.
	Contrast has been adjusted to the lowest degree	Confirm there is faint image in the LCD.	Push "Ctrl" and "Down arrow" key simulta-neously to adjust contrast high enough.
	Power issue: AC cord **Action:** Inspect AC power connections.	AC is applied but AC Power On indicator LED is dark.	Ensure AC cord is not damaged and is plugged into appropriate live AC power socket.
	Power issue: Battery **Action:** Open battery compartment door and inspect battery condition.	AC is not attached and the battery is plugged into the cardiograph. Push the on/standby button. The screen remains dark.	Replace battery.
	Power issue: Supply	AC is applied but AC Power On indicator LED is dark. AC cord and connection are verified and are good.	Unit must be serviced to replace power supply.
	Power off mode failure	With battery plugged in, the printer is making a clicking sound every 6 seconds.	Press rear reset button to reboot unit.
	LCD panel failure	Replace with a good LCD panel to see if it can light.	Send to Philips for repair.

Table 4-1 Display Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
	LCD backlight board failure.	Replace with a good backlight board to see if the LCD can light.	Send to Philips for repair.
	Main controller board failure	With the battery plugged in, the printer is making a clicking sound every 6 seconds. Reset button does not reboot unit.	Send to Philips for repair.
Screen shows CRC check failure	Application software is damaged	Unit stops at the 'COPYRIGHT' screen and a warning dialog pops up with the message 'CRC failed'.	Send to Philips for repair.
A dialog shows software version information with black ground	File system is destroyed	Unit stays on the black screen. A dialog shows software version information, including the loader & kernel version and the PCMCIA storage card status.	Send to Philips for repair.

Keyboard/Trim Knob/Dedicated Key Issues

Table 4-2 Keyboard/Trim Knob/Dedicated Key Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Keyboard is unresponsive	Keyboard controller subsystem has failed.	Keyboard is still unresponsive.	Send to Philips for repair.
Keyboard is typing incorrect characters	Keyboard controller subsystem has failed.	Keyboard is now functional.	Occasional recoverable keyboard failures have been observed. If failures persist, send to Philips for repair.
	Keyboard has Caps Lock enabled. **Action:** Inspect the incorrect typed characters on the display. If only the case of the characters is incorrect, press the Caps Lock key.	Do the characters now appear correctly?	Training on Caps Lock use.
	Keyboard controller subsystem has failed.	Keyboard is now functional.	Occasional recoverable keyboard failures have been observed. If failures persist, send to Philips for repair.
	During upgrading, user selects wrong keyboard version for current locale. Registry is lost.		Send to Philips for repair.

Signal Acquisition Issues

Table 4-3 Signal Acquisition Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
All leads show leads off (red dashed line) *continuously*	PIM communications have been lost for USB connection failure.	Unplug PIM from cardiograph, then plug it back in. Wait about 10 seconds to check the wave is normal. If the wave isn't normal yet, reset cardiograph and see if the wave is normal.	Unplug PIM from cardiograph, then plug it back in. Reset cardiograph.
One or more leads show leads off (red dashed line) *periodically*	PIM failure. **Action:** Reset unit using rear button.	Plug in a good PIM to confirm the waveform is normal.	Replace with a good PIM.
	Defib or high noise event **Action:** Observe frequency and recovery behavior.	Leads off coincides with electrode movement or placement or defib event.	The PIM performs an automatic ranging action when input signals vary significantly. If this behavior persists, send to Philips for repair.
	Electrode lead failure **Action:** Attach ground plate to leads and observe lead status. Confirm that the physical connections between the lead cables and PIM are good and the cables are undamaged.	Lead(s) still showing leads off periodically.	Send to Philips for repair.
One or more leads show leads off (red dashed line) *continuously*	Electrode lead failure **Action:** Attach ground plate to leads and observe lead status. Confirm that the physical connections between the lead cables and PIM are good and the cables are undamaged.	Lead(s) still showing leads off.	Send to Philips for repair.

Real Time Screen Issues

Table 4-4 Real Time Screen Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Waveform display is no longer updating, system is unresponsive	Main controller board failure **Action:** Wait for 2 minutes or longer. The unit will restart automatically, or you can restart it by pushing the reset button. If the automatic reset message does not appear, press the rear reset button.	Reset the unit to see if the unit can work normally.	Send to Philips for repair.
System seems to be running slowly after boot-up	Duplicate static IP configured for network **Action:** Confirm that the static IP assigned is not already in use on LAN.	IP was already in use.	It has been observed that bootup and operation can initially be slower when the PageWrier Trim is configured for an IP address that is already in use on the network.

Archive Screen Issues

Table 4-5 Archive Screen Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
After attempting an Archive screen operation, an error message appears: **Command timed-out**	TraceMaster system is busy. **Action:** Retry TraceMaster operation.	Operation succeeds on subsequent try.	Transfer operations use network and server resource, which may occasionally be unable to service the requests.
After attempting an Archive screen operation, an error message appears: **Requested Function Failed.**	Network or modem phone line was interrupted during operation. **Action:** Retry operation. Inspect cabling to network or analog phone line.	Operation succeeds on subsequent try or damaged cabling or intermittent connection found.	Transfer or query operations require reliable access to the network transport.

Table 4-5 Archive Screen Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
After attempting an Archive screen operation, an error message appears: **Requested Function Failed.**	Selected external archive media was not available. **Action:** Verify that selected archive media is inserted correctly (PC card).	Media is not present or media is not operational.	Attempting operations on invalid or missing external media archives will fail and display this message. Retry with correct and operational media inserted.
	An attempt to transfer an unsupported ECG report type was made to Trace-Master **Action:** Inspect ECG that failed the requested operation for selected format (report type).	Format is Pan 12 or 12x1.	Certain new report types are not supported by and will be rejected by the Trace-Master management system.
When an error occurs during transfer of multiple ECGs to a Trace-Master system, the transfer process does not continue and transferred files are not deleted.	Application limitation **Action:** None.	Current system limitation.	The current PageWriter Trim operations fail in a known safe manner when multiple ECG transfer operations are interrupted. Retry the transfer for the remaining ECGs.
After pressing the **Archive** button, it takes longer than 40 seconds before the Archive list is displayed when the main archive has more than 130 ECGs stored.	System slow-down from full ECG database **Action:** Save or delete ECGs from the main archive.	Entry into the Archive Screen is faster.	There is a known system performance impact when the near maximum (200) number of ECGs has been stored in the main archive area.
The message Requested Function Failure appears after fax ECG transmission has completed.	Fax application time-out. **Action:** Dismiss the Fax dialog box after transmission completes by touching **OK**.	Message no longer appears after FAX ECG transmission.	The FAX application requires the user to close the dialog box after success is reported. Otherwise, the operation times out and indicates a failure.

Table 4-5 Archive Screen Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Transfer of an ECG to a PC card flash archive fails and there are still less than 200 ECGs on the flash card.	PC card flash file system limitation **Action:** Delete extra non-ECG files from flash card.	ECGs can now be transferred.	Delete unwanted files from flash card.
Some ECGs retrieved from TraceMaster and printed on the cardiograph look different from TraceMaster prints or XLi printouts.	Older or non-PageWriter Trim source ECG files were retrieved.l **Action:** Inspect the printed report date and information	ECG was not created by a PageWriter Trim cardiograph.	Retrieving and printing older ECG files that were not sourced by the Page-Writer Trim cardiograph can have the following differences when printed: ■ Algorithm version appears as HPxxx on TraceMaster and PH on PageWriter Trim. ■ Pacer tick marks are not present on PageWriter Trim printout. ■ Frank lead system generates 3 rhythm traces with flat line and no lead label on PageWriter Trim printout. ■ Custom lead names do not appear on PageWriter Trim printout. ■ PageWriter Trim prints full interpretations regardless of original Xli ECG settings.

Printer Issues

Table 4-6 Printer Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
After the paper drawer was opened during printing, the print image was corrupted or incorrect.	Printer controller error **Action:** None	Printing continued on second page when only one page was expected.	Occasional printer controller status errors can occur when opening the paper drawing during printing.
After the paper drawer was opened during printing, the print image was corrupted or incorrect and the paper does not stop feeding.	Printer controller error **Action:** Press the rear reset button.	Unit resets and boots correctly. Paper stops feeding.	Occasional printer controller status errors can occur when opening the paper drawing during printing.
The message Printer Door is Open appears, and the unit is not responding. (Ruby 100 Error Code: 0203)	Application error **Action:** Press the rear reset button.	Unit resets and boots correctly.	It has been observed that on rare occasions a Printer Door Open message cannot be dismissed because of overlapping simultaneous error status reporting.
The message Check Printer appears with no apparent printer problem present.	Printer controller error **Action:** Open and close printer paper drawer.	Message does not reoccur.	Infrequently, the printer controller may indicate a printer mechanism status error when no error exists. This has been noted specifically when A4 paper is in use.
Printed report looks too small or compressed.	Printer controller error **Action:** Press the rear reset button.	Unit resets and boots correctly. Reports print correctly.	On very rare occasions, reports with A4 paper show a compressed image. Reset the unit to resolve the issue.
After opening and closing the paper drawer rapidly many times, the unit was unresponsive.	Printer controller error **Action:** Press the rear reset button.	Unit resets and boots correctly. Reports print correctly.	A rapid and sustained repeating open-and-close action on the paper drawer can cause an application error related to printer status handling.

Table 4-6 Printer Issues *(continued)*

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Printer Error: Out of Paper/Paper Jam/ Door Open (PageWriter Trim I Error Code 0204/ 0203)	■ Paper drawer is not fully closed ■ Out of paper, or paper loaded incorrectly ■ Defective TOF sensor assembly ■ Defective paper tray assembly	Error does not occur again.	■ Open and firmly close the paper drawer. ■ Open paper drawer and check to make sure paper is aligned correctly. ■ Replace TOF sensor assembly. ■ Replace paper tray assembly.
Printer not detected message	■ Application error ■ Unseated or defective main harness assembly ■ Defective printer control board	Message no longer appears.	■ Press the rear reset button. ■ Check seating of main harness assembly. Replace if necessary. ■ Replace the printer control board.
Paper does not advance	■ Application error ■ Defective TOF sensor assembly ■ Defective printer gearbox assembly	Paper advances correctly.	■ Press the rear reset button. ■ Replace the TOF sensor assembly. ■ Replace the printer gearbox assembly.
Paper does not tear off cleanly, or paper stops at the wrong spot	■ Wrong paper size setting ■ Wrong method is being used to tear off paper	Paper tears cleanly and advances correctly.	■ Check that paper size is correctly set in the cardiograph configuration. ■ See page 3-4 in this manual or refer to the *PageWriter Trim Instructions for Use* for the proper method for tearing paper.
Blank pages printed after report	Wrong paper size setting	No blank pages print after changing paper size.	Check that paper size is correctly set in the cardiograph configuration.
On Chinese unit, test report is missing Chinese characters	Only the Chinese application is updated on an English unit.	Report prints correctly after being reinstalled.	Send to Philips for repair.

PC Card Issues

Table 4-7 PC Card Issues

Symptom	Possible Cause & Investigation Step	Confirmation	Solution
Occasionally, copying ECGs from archive to Flash card fails.	PC card subsystem time-out failure **Action:** Retry the transfer operation.	Operation succeeds without error.	Write operations occasionally fail for Flash cards. If this condition reoccurs persistently, replace the flash card.
Modem is unavail-able after removing and reinserting the PC card into the cardiograph.	Main controller error **Action:** Put the unit into standby, and then press the rear reset button.	Modem is now available.	Hot-swapping the modem after boot of the system is not supported. You must reset the system when reinserting the modem PC card.

5

Performance Verification and Safety Tests

This chapter describes the tests and inspections required to verify performance of the PageWriter Trim cardiograph following a service event.

This chapter provides the following information:

Required Testing Levels 5-1
External Repairs 5-1
Internal Repairs 5-2
Upgrades 5-2
Test and Inspection Matrix 5-3
Test Equipment 5-4
Performance Verification Tests 5-4

Required Testing Levels

The Performance Verification Tests verify proper operation of the PageWriter Trim following a service event. The level of testing required corresponds to the type of service performed.

NOTE Installation and Preventive Maintenance are not considered service events since the cardiograph is designed to be installed and maintained by the user. Service Events are divided into two categories: repairs and upgrades. Repairs are then further divided into external repairs and internal repairs.

External Repairs

External repairs consist of the repair or replacement of one or more items when the repair or replacement does not require you to open the cardiograph case. Therefore, only a limited number of tests are necessary to verify performance after a repair. External repairs that involve the PIM and PIM lead set require an ECG simulation test to verify proper ECG signal path.

The typical external repairs include:

- PIM
- Patient Leads
- Labels
- Battery

- Paper Tray
- AC Power Cord
- Fuses
- PCMCIA card (For Trim II/III/Rx only)
- PCMCIA network Lan Card (For Trim II/III/Rx only)
- Bar Code reader (For Trim II/III/Rx only)
- 'Smart' IC Card Reader (For Trim II/III/Rx only)
- Magnetic Card Reader (For Trim II/III/Rx only)
- Modem card (For Trim II/III/Rx only)
- Shielded Lan Cable
- Cart (Trolley)
- External cables

Refer to Table 5-1 for the required test blocks that must be performed after any external repair occurs.

Internal Repairs

Philips does not support internal repairs performed by users. Only authorized Philips personnel can perform internal repairs.

If the case was opened, regardless of the repair, you must perform additional Performance Verification Tests. Refer to Table 5-1 for the required test blocks that must be performed after any internal repair.

Upgrades

Most PageWriter Trim upgrades are installed by the user, and are not considered service events. The only exceptions are upgrades for the software and the Magnetic Card Reader. Refer to Table 5-1 for the required test blocks that must performed after these upgrades.

Table 5-1 Tests Required

Service Event		Test Blocks Required
Repairs	External repairs not involving the patient module, such as battery, fuses, labels, cart, etc.	Perform Visual Inspection, Power On test, and functional tests specific to the components repaired.
	External repairs where the cardiograph case is not opened, but involving the patient module or patient lead set.	Perform Visual Inspection, Power On test, ECG simulation test, and functional tests specific to the components repaired.

Table 5-1 Tests Required *(continued)*

Service Event		Test Blocks Required
	Internal repairs where the cardiograph case is opened.	Perform Visual Inspection, Power On test, ECG simulation test, safety tests S1, S2, and S3, plus functional tests specific to the components repaired.
Upgrades	Software upgrades (via external PCMCIA slot)	Perform Power On test.
	Hardware upgrades	Perform Power On test, and functional tests specific to the components repaired.

Test and Inspection Matrix

The following Test and Inspection Matrix describes the various test blocks, expected test results, and what you need to document on the service record.

Table 5-2 Test and Inspection Matrix

Test Block Name	Test or Inspection to Perform	Expected (Passing) Test Results	What to Record on a Service Record
Visual Inspection (V)	Perform visual inspection.	If there is no apparent wear, damage, or corrosion, the visual inspection passes.	V:P (pass) V:F (fail)
Power On (PO)	Power on the unit. Watch display for error codes. See Chapter 4, “Troubleshooting” for a list of codes.	If the display shows the PageWriter Trim splash screen followed by the R/T ECG screen, the Power On test passes.	PO:P (pass) PO:F (fail)
ECG Simulation (ECG)	Connect a 12 Lead Patient Simulator to the lead set and print a 12 lead ECG. Visually analyze the printout. See page 5-6.	If there is trace activity in all 12 leads with no notable distortion or noise, and cal pulses of proper duration and amplitude, then the ECG Simulation passes.	ECG:P (pass) ECG:F (fail)

Table 5-2 Test and Inspection Matrix *(continued)*

Test Block Name	Test or Inspection to Perform	Expected (Passing) Test Results	What to Record on a Service Record
Safety (S1)	■ Earth leakage current NC (normal condition) ■ Earth leakage current SF (Single Fault) See page 5-7.	NC Maximum leakage current ≤ 300 uA (UL) ≤ 500 uA (IEC) x1 SF Maximum leakage current ≤ 1000 uA x2	Example: S1:P/100/200
Safety (S2)	Protective earth resistance See page 5-7.	Maximum impedance ≤ 200 milli Ω x1	Example: S2:P/100
Safety (S3)	Leads leakage current ■ Source (Normal condition) ■ Source (Single Fault condition) ■ With Mains on applied part (Single Fault Condition) See page 5-8.	≤ 10 uA x1 ≤ 50 uA x2 ≤ 50 uA x3	Example: S3:P/5/20/20

Test Equipment

The following test equipment is required to perform the complete set of Performance Verification tests:

- ECG Simulator
- Electrical Safety Tester
- Software Support Kit (CF Card with PCMCIA Adapter). Order part number 453563479701 through your Philips authorized service parts supplier.

Performance Verification Tests

Visual Inspection (V)

1. Before beginning the inspection, press the On/Standby button to put the cardiograph in Off mode, and unplug the power cord from the wall outlet.
2. Inspect the cardiograph external surfaces for the following:
   – Worn or damaged power cord

- Loose or missing hardware
- Mechanical damage
- Evidence of liquid spill
- Worn printer drive gear
- Worn printer roller
- Corroded or damaged reusable electrodes, if present
- Damaged patient leads
- Dirt/paper residue on the thermal print head
- Frayed or damaged wiring
- Visible LCD display damage

3 Replace any damaged or missing items.

4 Clean the patient leads as necessary. See Chapter 3, “Cardiograph Care and Maintenance” for cleaning instructions.

Power On Test

To process a completed Power On test, you must completely reboot the cardiograph.

To reboot the cardiograph

1 Press the On/Standby button for 2-3 seconds to put the cardiograph in off mode.

2 Power on the cardiograph by pressing the On/Standby button.

3 If steps 1 and 2 do not work, press the reset button. To perform a soft reset, gently press the Reset button located next to the serial port on the back of the cardiograph. See Figure 5-1 and Figure 5-2.

After approximately 20 seconds, the PageWriter Trim II/III/Rx Splash screen appears, followed by an audible beep. For the PageWriter Trim I, the screen with five triangles appears.

Figure 5-1 Rebooting the Cardiograph (Trim II/III/Rx)

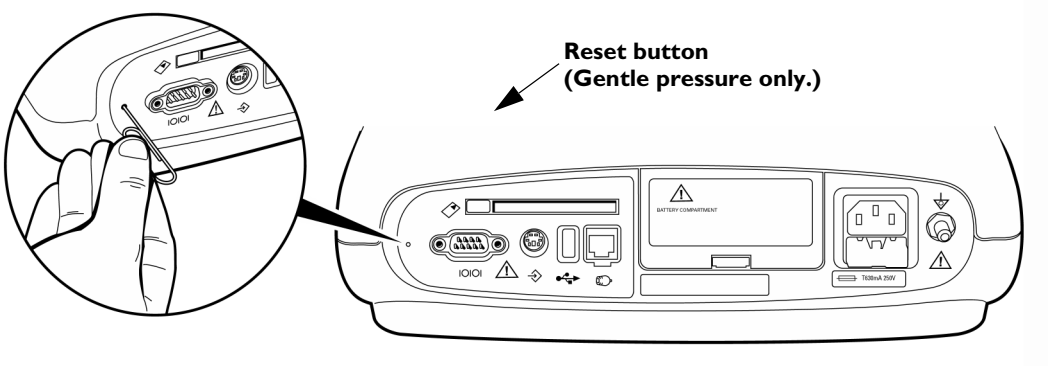
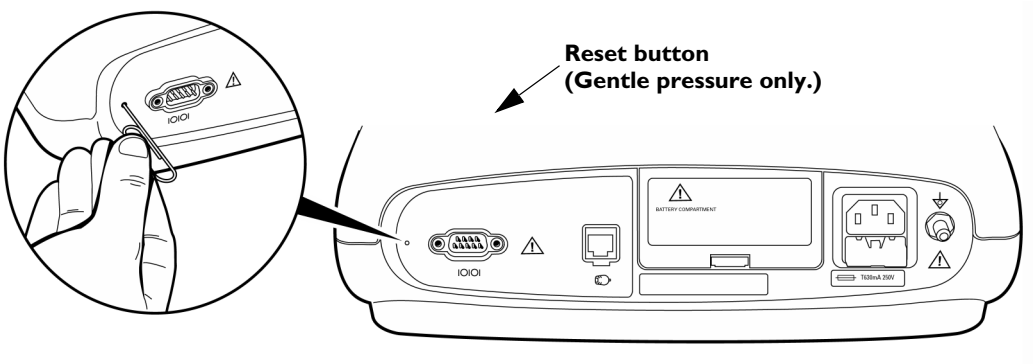


Figure 5-2 Rebooting the Cardiograph (Trim I)



The following self-tests are automatically performed during reboot:

- RAM
- Software CRC Test
- Flash Memory: onboard CompactFlash (CF)
- PIM Status
- Battery Voltage Test
- Printer Status

ECG Simulation (ECG)

Taking an ECG using a 12-lead ECG simulator allows you to verify areas of operation that the extended self-test cannot check:

- Integrity of the patient leads
- Accuracy of the paper speed (not available on all simulators)
- Accuracy of the gain settings (not available on all simulators)

Trace differences may result from difference in simulators, simulators settings, and from differences in configuration and control settings on the cardiograph.

To perform the ECG Simulation Test

1. Connect the PIM lead wires to the simulator.
2. Verify that all lead wires are connected by observing the display for:
   - Flat lines or leads off information (for Trim II/III/Rx)
   - Leads off indicator (for Trim I)
3. Firmly pull each lead wire tight, and then look for excessive noise on the display (may be indicated by yellow or orange waveforms).
4. Select **Auto** to start an AUTO 12-Lead recording.

   Depending on the cardiograph's configuration, the ECG may be printed automatically at this point, or it may only be previewed on the display.

5 If the ECG is not printed automatically, select **Enter** to start printing.

Verify the following when printing is complete:

- Trace activity for all 12 leads. Confirms integrity for all patient electrodes and leadwires. Noise should measure less than one (1) mm, with no baseline wander.
- No gross distortion of complexes or calibration pulses (no overshoot and so forth).
- Duration for calibration pulses for correct paper speed. With cardiograph set to record at 25 mm/sec, the calibration pulse should measure 5mm (calibration pulse duration is 200 ms).
- Calibration pulse amplitude is correct.

NOTES

- An arrhythmia simulator is not an acceptable tool for verifying computerized ECG analysis. The analysis software is biased to process human ECG data.
- Noise may be an artifact of poor connections to the simulator or position of the cables. If noise appears, check the connectors or adjust the cable drape.

Safety Tests

This section explains tests of the cardiograph's electrical safety.

- Use the procedures called out by the manufacturer of the safety analyzer in use.
- Test both Normal and Reverse polarity line connections for each test, and record the worst-case value.
- If a ground reference point is needed for the testing, use the metal grounding stud on the back of the cardiograph.

Safety Test S1 - Earth Leakage

To check for leaks in the ground wire for the AC power cord.

- Normal Condition with both AC line connections intact:
  - $\leq$ 300 μA (UL, 120 VAC)
  - $\leq$ 500 μA (IEC, 240 VAC)
- Single Fault Condition with one AC line connection open:

  $\leq$ 1000 μ A

Safety Test S2 - Protective Earth Resistance

Impedance of protective earth ground:

$\leq$ 200 mΩ

Safety Test S3 - Leads Leakage Current

Leakage from Source or into Sink patient leads (Applied Parts)

- Source
  - Normal Condition with both AC line connections and earth ground intact:

    $\leq$ 10 μA
  - Single Fault Condition with separate open neutral and open earth, each in turn:

    $\leq$ 50 μA
- Sink

  Single Fault Condition with AC Mains voltage on Applied Parts (both AC line connections and earth ground intact).

  $\leq$50 μA

6

Removing and Replacing Cardiograph Components

This chapter contains information on removing and replacing the PageWriter Trim battery, fuses, and paper tray. If you require further technical assistance, contact the nearest Philips Response Center. See “Contacting a Philips Response Center” on page 1-17.

NOTE The way the wires and cables are routed and dressed inside the main housing plays an important part in reducing electromagnetic and radio frequency interference emitted by the cardiograph. When you reassemble any part of the cardiograph, make sure to route and dress all cables and wires as they were originally placed.

This chapter provides the following information:

About the Cardiograph Components. 6-1
Removing and Replacing the Battery 6-2
Removing and Replacing the AC Fuses 6-3
Removing and Replacing the Paper Tray 6-4

About the Cardiograph Components

The cardiograph includes the following customer-installable components. For detailed illustrations and exploded views, see Chapter 7, “Parts and Accessories”.

- Battery compartment
- AC fuses
- Paper tray

Removing and Replacing the Battery

All of the PageWriter Trim models use the same single battery (part number 989803130051). Removal and replacement procedures are the same for all models.

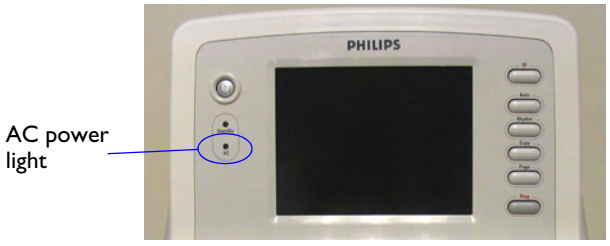
Removing the Battery

To remove the battery

1 Unplug the AC power cord.

Make sure the green AC power indicator light is not illuminated.

Figure 6-1 AC power light



For an overview of cardiograph components, see Chapter 7, “Parts and Accessories”.

2 Pull up on the battery door tab and remove the door.

Figure 6-2 Removing the battery door

3 Pull open the battery tab and pull out the battery.

Figure 6-3 Removing the battery

WARNING **Properly dispose or recycle any depleted batteries according to local regulations. Do not disassemble, puncture, or incinerate the batteries.**

Replacing the Battery

To replace the battery

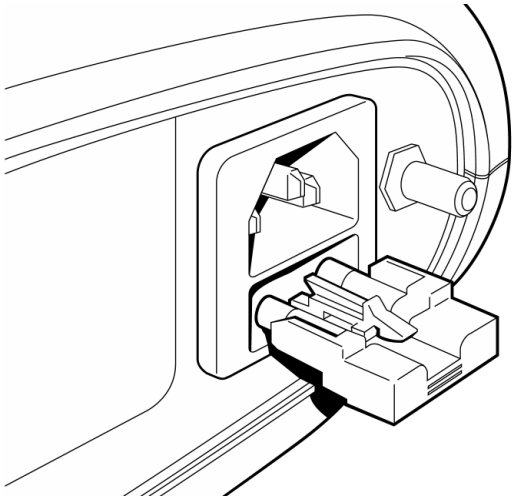
1. Insert the new battery into the battery slot, and push it in until it clicks into place.
2. Re-attach the battery door.

Removing and Replacing the AC Fuses

The AC fuse needs to be replaced when the cardiograph is plugged into AC power, but the green AC power indicator light on the front of the cardiograph does not illuminate.

Only use replacement AC fuses with Philips part number 453564000371 or use a 1.5 amp (250V) time-delay fuse the same size and configuration as the original fuse.

Figure 6-4 Replacing the AC Fuse



To replace the AC fuse:

1. Unplug the cardiograph from AC power. Pull out the AC power cord from the AC power connector on the rear of the cardiograph.
2. Locate the AC fuse, which is directly below the AC power connector.
3. Push down on the center tab on the fuse and pull out the fuse from the fuse holder slot.
4. Insert the new fuse using the same orientation, with the center tab facing up.
5. Push the fuse all the way into the fuse holder slot. The fuse snaps into place.

Removing and Replacing the Paper Tray

The paper tray is the same for all PageWriter Trim models.

Removing the Paper Tray

To remove the paper tray

1. Pull out the paper tray until it stops.
2. Remove any unused paper.
3. Carefully lift tray, and pull it out completely.

Replacing the Paper Tray

To replace the paper tray

1. Insert the paper tray into the opening.
2. Replace the paper.
3. Close the paper tray.

7

Parts and Accessories

This chapter provides information on ordering customer-installable replacement parts, supplies, and accessories for the PageWriter Trim cardiographs. It shows illustrated, detailed views of each of the PageWriter Trim subassemblies, together with each element's part number to facilitate part ordering.

This chapter provides the following information:

Ordering Replacement Parts 7-1
Ordering Supplies and Accessories. 7-1
PIM Assembly and Parts 7-2
Cart Assembly and Parts 7-3

Ordering Replacement Parts

To order replacement parts, use prefix number prefix 45.

In the US, call 877-447-7278

Outside the US, contact your local Philips Medical Systems Response Center. See "Contacting a Philips Response Center" on page 1-17.

Ordering Supplies and Accessories

To order medical supplies for the cardiograph, refer to "Ordering Supplies, Options and Accessories" on page 1-12 or to the *PageWriter Trim Cardiograph Getting Started Guide*.

In the US, call 1-800-225-0230.

Outside the US, contact your local Philips Medical Systems Sales Office, or your authorized Philips Medical Systems Dealer or Distributor.

You can also visit our web site at: http://shop.medical.philips.com.

PIM Assembly and Parts

Figure 7-1 PIM Assembly

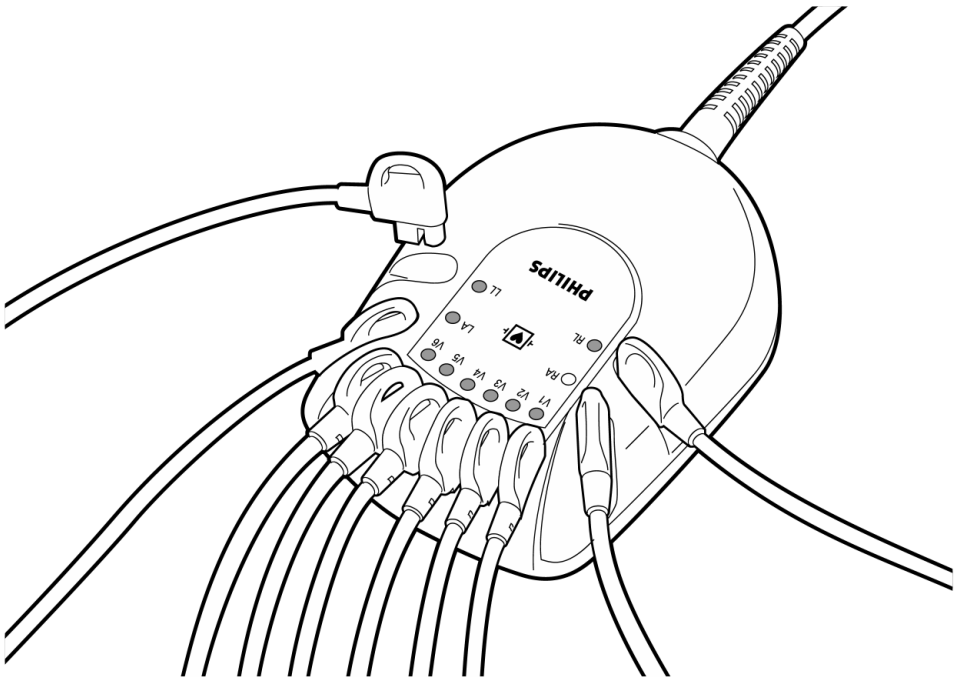


Table 7-1 PIM Assembly and Parts

Reference Number	Description	Part Number
1	Patient Module AHA PW-FS - New	453564000221
2	Patient Module IEC PW-FS - New	453564000231
3	Patient Module AHA PW-FS - Exchange	453564000151
4	Patient Module IEC PW-FS - Exchange	453564000161

Cart Assembly and Parts

Figure 7-2 Cart Assembly

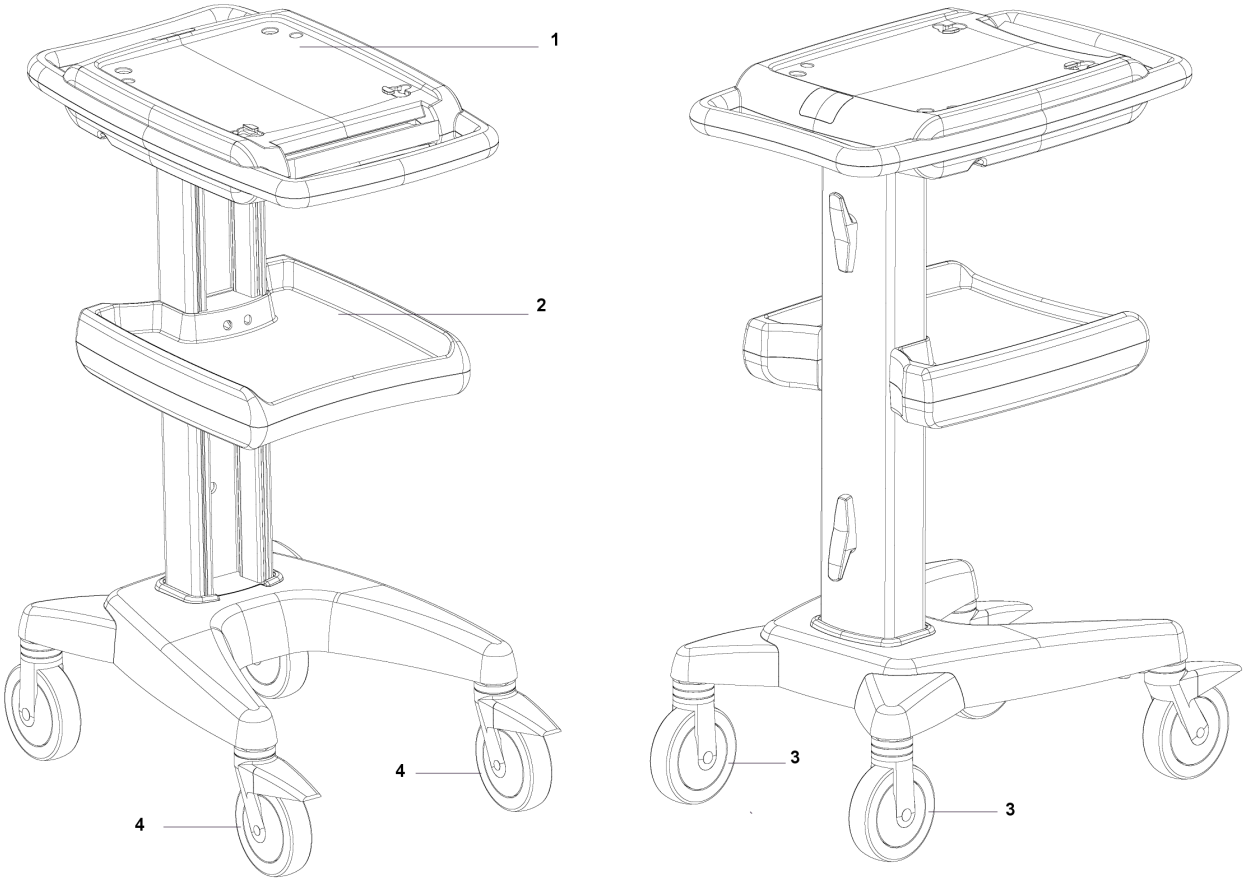


Table 7-2 Cart Assembly Parts List

Reference Number	Description	Part Number
1	Replacement Table Kit	453564007471
2	Replacement Shelf Kit	453564007481
3	Front Caster Kit (2 required)	453564006531
4	Rear Caster Kit (2 required)	453564007501

A

Specifications

Technical Specifications

ECG Acquisition

- Auto (12 leads)
- Rhythm (up to 12 leads)
- Disclose (1 lead)

Keyboard

- Full alphanumeric capability

Screen Display

- 640 x 480 pixel resolution
- Color TFT display

Patient Interface Module

- Remote, microprocessor-controlled module

Cardiograph Cart

- The cardiograph cart (optional accessory) has been tested for stability using the IEC 60601-1 test protocol.
- The IEC 60601-1 protocol calls for the cardiograph cart to not tip over using a 10 degree angle of incline in any direction. It is possible to exceed this amount of incline when the cardiograph and cart are moved over a roadside curb or some other small but steep incline. Use care when moving the cardiograph cart.
- Always remove the patient cable arm before transporting. Install the cart counterbalance prior to the installation of the Patient Cable Arm.

Signal Processing/Acquisition

Sampling Rate

- 2,000 samples per second per electrode/lead
- 24 bit A/D conversion provides 5µV resolution

Auto Frequency Response

0.05-150 Hz, 0.15-150 Hz, 0.5-100 Hz
0.05-100 Hz, 0.15-100 Hz, 0.5-100 Hz
0.05-40 Hz, 0.15-40, 0.5-40 Hz

Rhythm Frequency Response

0.05-150 Hz, 0.15-150 Hz, 0.05-150 Hz
0.15-100 Hz, 0.05-40 Hz, 0.15-40 Hz

Filters

- AC noise
- Baseline Wander
- Artifact
- High and Low Pass Frequency

Printer

Printer Resolution

- High-resolution, digital-array printer using thermal-sensitive paper
- 200 dpi at 25 mm/sec (voltage axis) by 500 dpi (time axis)

Report Formats

- 3x4 1R, 3R (Standard, Cabrera)
- 6x2 (Standard, Cabrera)
- Panoramic 12 (Cabrera)
- 12x1(Standard, Cabrera)
- Rhythm (up to 12 selected leads)
- 12-Lead Extended Measurements
- Disclose (1 minute of continuous waveform data for 1 selected lead)

Battery Operation

Capacity

- Typically 30 ECGs on a single charge or 30 minutes of continuous rhythm recording
- No fail operation during ECG printing

Recharge

- Eight hours to full capacity

Network Connection

- 10 Base-T IEEE 802.3 Ethernet LAN

FAX Capability (optional)

- Group 3, Class 1 or 2 fax modem protocol
- Support for PCMCIA fax modem

Modem (optional for USA and Canada)

- V.90, K56flex, enhanced V.34, V.32bis, V.32, V.22 bis and below

Barcode Reader (optional)

- Reads Code 39 (standard and full ASCII) Symbology

Magnetic Card Reader (optional)

- Reads cards adhering to ISO 7810, 7811-1, -2, -3, -4, -5, and JIS X 6301 and X6302

ECG Storage

- 150 ECGs typical for the optional 128 MB PC Card

PageWriter Trim II:

- 50 ECGs

PageWriter Trim III:

- 150 ECGs

ECG File Formats

- XML and XML SVG

Power and Environment

- Class I, continuous operation

Line Power

- 100-240 Vac, 50/60 Hz, 65 VA max

Environmental Operating Conditions

- 10° to 40°C (50° to 104°F)
- 15% to 80% relative humidity (non-condensing)
- Up to 4,550 m (15,000 ft.) altitude

Environmental Storage Conditions

- 0° to 50 °C (32° to 122°F)
- 15% to 90% relative humidity (non-condensing)
- Up to 4,550 m (15,000 ft.) altitude

Cardiograph Dimensions

Trim I

- 310 mm width x 388 mm depth x 106 mm height (12.2 x 15.3 x 4.2 inches)

Trim II/III

- 310 mm width x 388 mm depth x 176 mm height (12.2 x 15.3 x 6.9 inches)

Cardiograph Weight

Trim I

- 6.95 Kilograms (15.3 pounds)

Trim II/III

- 7.38 Kilograms (16.3 pounds)

Cardiograph Shipping Container Dimensions

- 603.2 mm (width) x 1016 mm (depth) x 742.95 mm (height) (23.74 x 40 x 29.25 inches)

Cardiograph Shipping Container Weight

- 6.325 Kilograms (14 pounds)

Cardiograph Cart Dimensions

- 416 mm (width) x 600 mm (depth) x 930 mm (height) (16.37 x 23.6 x 36.6 inches)

Cardiograph Cart Weight

- 21 Kilograms (46.29 pounds) without patient cable arm and counter weight installed on cart

Cardiograph Cart Shipping Container Dimensions

- 609.6 mm (width) x 736.6 mm (depth) x 1016 mm (height) (24 x 29 x 40 inches)

Cardiograph Cart Container Weight

- 6.57 Kilograms (14.48 pounds)

Safety and Performance

Meets or exceeds the following requirements for safety and performance:

- IEC 60601-1: 1988 +A1:1991 +A2:1995 General Requirements for Safety including all National Deviations
- IEC 60601-1-2: 2001 General Requirements for Safety Electromagnetic Compatibility
- IEC 60601-2-25 1993 +A1:1999 Safety Of Electrocardiographs
- CISPR 11:1997 Radio Frequency disturbance, Limits and Methods of Test
- AAMI EC11: 1991 Diagnostic Electrocardiographic Devices
- JIST 1202: 1998 Japanese Industrial Standard for Electrocardiographs

Electromagnetic Compatibility (EMC)

Electromagnetic compatibility with surrounding devices should be assessed when using the PageWriter Trim cardiograph.

An electronic device can either generate or receive electromagnetic interference. Testing for electromagnetic compatibility (EMC) has been performed on the PageWriter Trim cardiograph according to the international standard for EMC for medical devices (IEC 60601-1-2). This IEC standard has been adopted in Europe as the European Norm (EN 60601-1-2).

The PageWriter Trim cardiograph should not be used adjacent to, or stacked on top of other equipment. If the PageWriter Trim cardiograph must be used adjacent to or stacked on top of

other equipment, verify that the cardiograph operates in an acceptable manner in the configuration in which it will be used.

The cardiograph will not malfunction when used with electrosurgical equipment.

Fixed, portable, and mobile radio frequency communications equipment can affect the performance of medical equipment. See Table A-4 on page A-9.

Reducing Electromagnetic Interference

The PageWriter Trim cardiograph and accessories may become sensitive to interference from other RF energy sources including power lines. RF energy sources include other medical devices, wireless devices, information technology equipment, and radio/television transmission. Should interference be encountered, as demonstrated by artifact on the ECG trace, attempt to locate the source by assessing:

- if the interference is intermittent or constant?
- does the interference occur only in certain locations?
- does the interference occur only when in close proximity to certain medical devices?
- does the ECG signal quality change dramatically when the AC power cord is unplugged?

Once the source of the interference is located, attempt to attenuate the EMC coupling path by distancing the cardiograph from the source of the interference as much as possible. If further assistance is needed, contact the Philips Response Center nearest you.

Table A-1 Guidance and Manufacturer's Declaration: Electromagentic Emissions

The PageWriter Trim cardiograph is intended for use in the electromagnetic environment specified in the table below. The customer or the user of the PageWriter Trim cardiograph should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment: guidance
RF Emissions CISPR 11	Group 1	The PageWriter Trim cardiograph uses RF energy only for its internal function. Therefore, its RF emissions are very low are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	The PageWriter Trim cardiograph is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Table A-2 Guidance and Manufacturer's Declaration: Electromagnetic Immunity

The PageWriter Trim cardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the PageWriter Trim cardiograph should assure that it is used in such an environment.

Emissions Test	Compliance	Compliance Level	Electromagnetic Environment: guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	Complies	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast transient/burst IEC 61000-4-4	+/- 2 kV for power supply line +/- 1 kV for input/output lines	Complies	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	Complies	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (>30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 seconds	Complies	Mains power quality should be that of a typical commercial or hospital environment. If the user of the PageWriter Trim cardiograph required continued operation during power mains interruptions, it is recommended that the PageWriter Trim be powered from an uninterruptable power supply or a battery.
Power frequency (50./60 Hz) magnetic field	3 A/m	Complies	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note: U_T is the a.c. mains voltage prior to application of the test level.

Table A-3 Guidance and Manufacturer's Declaration: Electromagentic Immunity

The PageWriter Trim cardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the PageWriter Trim cardiograph should assure that it is used in such an environment.

Emissions Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment: guidance
Conducted RF IEC 61000-4-6	3 *Vrms* 150 kHz to 80 MHz	Complies	Portable and mobile RF communications equipment should be used no closer to any part of the PageWriter Trim, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = \left[\frac{3,5}{3Vrms}\right]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 *Vrms* 80 MHz to 2.5 GHz	Complies	$d = \left[\frac{3,5}{3V/m}\right]\sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{7}{3V/m}\right]\sqrt{P}$ 800 MHz to 2.5 GHz Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol:

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from surfaces, objects, and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radios, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the PageWriter Trim cardiograph is used exceeds the applicable RF compliance level above, the PageWriter Trim cardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the PageWriter Trim cardiograph.
b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [3] V/m.

Table A-4 Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the PageWriter Trim Cardiograph: for equipment and systems that are not life-supporting

The PageWriter Trim cardiograph is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the PageWriter Trim cardiograph can help to prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the PageWriter Trim cardiograph as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter W	**Separation Distance According to Frequency of Transmitter (m)**	
	150 KHz to 800 KHz	800 MHz to 2.5 GHz
	$d = 1.2\ \sqrt{P}$	$d = 2.3\ \sqrt{P}$
0.01	0.1 m	0.2 m
0.1	0.4 m	0.7 m
1	1.2 m	2.3 m
10	4.0 m	7.0 m
100	12.0 m	23.0 m

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by the absorption and reflection from structures, objects, and people.

B

Maintenance Tests

This appendix provides instructions for performing maintenance tests on the PageWriter Trim II/III/RX from operating mode. These tests help you localize cardiograph problems to the subassembly level so you can efficiently repair the cardiograph with a minimum of equipment.

Maintenance Tests (Trim II/III/Rx only)

You can use the maintenance tests and diagnostic utilities in the ***operating mode*** to verify or optimize cardiograph performance. The can be used as the first step in identifying a technical problem with the cardiograph.

To open the Maintenance Test screen

1 Turn the Trim Knob to highlight the **Config** button on the Command Toolbar.

NOTE Access to Configuration may be password controlled.

2 Push the Trim Knob to select the button. The Configuration screen appears.

3 Select **System(S)** by holding down the Alt key on the keyboard, then pressing the S key. The System screen appears.

The **Diagnostics** section of the screen lists the five configuration/maintenance tests.

Test	Page
PIM Test	B-2
Barcode Test	B-2
Magcard Test	B-3
Printer Test	B-3
Network Test	B-5

Patient Interface Module (PIM) Test

This test is used to confirm that the Patient Interface Module (PIM) is communicating with the cardiograph. This test can be performed when the cardiograph displays Patient Interface Module error messages, or when the cardiograph is unable to acquire data from the PIM. Be sure that the PIM patient data cable is securely attached to the PIM connector on the rear of the cardiograph.

If this test fails, it may indicate a problem with the PIM or with the PIM patient data cable.

To perform the PIM Test:

1. Turn the Trim Knob to highlight the **PIM Test** button under **Diagnostics**.
2. Push the Trim Knob to select the button. The message **Accessing PIM...** appears. The **PIM Test Result** window appears and indicates that the PIM Test has passed, or that the cardiograph is unable to communicate with the PIM.
3. If the message **PIM Test Passed** appears, the PIM is communicating properly with the cardiograph. The **OK** button is highlighted. Push the Trim Knob to close the window.
4. If the message **Please Check the Patient Interface Module** appears, check that the PIM patient data cable is securely attached to the PIM connector on the rear of the cardiograph.

Barcode Reader Test

NOTE You must attach the barcode reader to the port on the rear of the cardiograph before powering on the unit.

The Barcode Reader Test is used with the optional barcode reader. This test can be used to confirm that the barcode reader is accurately scanning barcode data. Ensure that the barcode reader is securely attached to the barcode reader port on the rear of the cardiograph before performing the test.

To perform the barcode reader test:

1. Turn the Trim Knob to highlight the **Barcode Test** button under **Diagnostics**.
2. Push the Trim Knob to select the button. The Barcode Reader test window appears.
3. Hold the barcode reader at a 45^{o} angle and scan a test barcode.
4. The barcode data appears next to the **Patient ID** field. Review the barcode data to ensure that it is accurate. The **OK** button is highlighted. If the barcode data is accurate, push the Trim Knob to select the **OK** button. Turn the Trim Knob to highlight the **Cancel** button if the barcode data is incorrect.
5. If the test fails, perform a barcode reader calibration and try the test again. Refer to the *PageWriter Trim Cardiograph Instructions for Use* for instructions.

Magnetic Card Reader Test

NOTE You must attach the magnetic card reader to the port on the rear of the cardiograph before powering on the unit.

The Magnetic Card Reader Test is used with the optional magnetic card reader. This test can be used to confirm that the magnetic card reader is correctly reading data from a magnetic card. Ensure that the magnetic card reader is securely attached to the magnetic card reader connector on the rear of the cardiograph.

To perform the magnetic reader test:

1. Turn the Trim Knob to highlight the **Magcard Test** button.
2. Push the Trim Knob to select the button. The Magnetic Card Reader window appears.
3. Insert the magnetic card into the slot.
4. Leave the magnetic card in the slot for five seconds and then pull it out.
5. The magnetic card data appears next to the **Patient ID field.**
6. Review the data to ensure that it is correct. The **OK** button is highlighted. If the magnetic card data is accurate, push the Trim Knob to select the **OK** button. Turn the Trim Knob to highlight the **Cancel** button if the magnetic card data is incorrect and push to select it.
7. If the test fails, try it again.

Printer Test

The Printer Test is used to verify that the cardiograph printer is able to correctly print the test page. Use this to verify proper printer performance or when reports appear to have print quality errors.

To perform the print test:

1. Turn the Trim Knob to highlight the **Printer Test** button under **Diagnostics**.
2. Push the Trim Knob to select the button. The message **Printing Test Page...** appears and the test page prints out.
3. Review the printer test page at points A, B, C, and D as shown on Figure B-1, “Printer Test Page”.

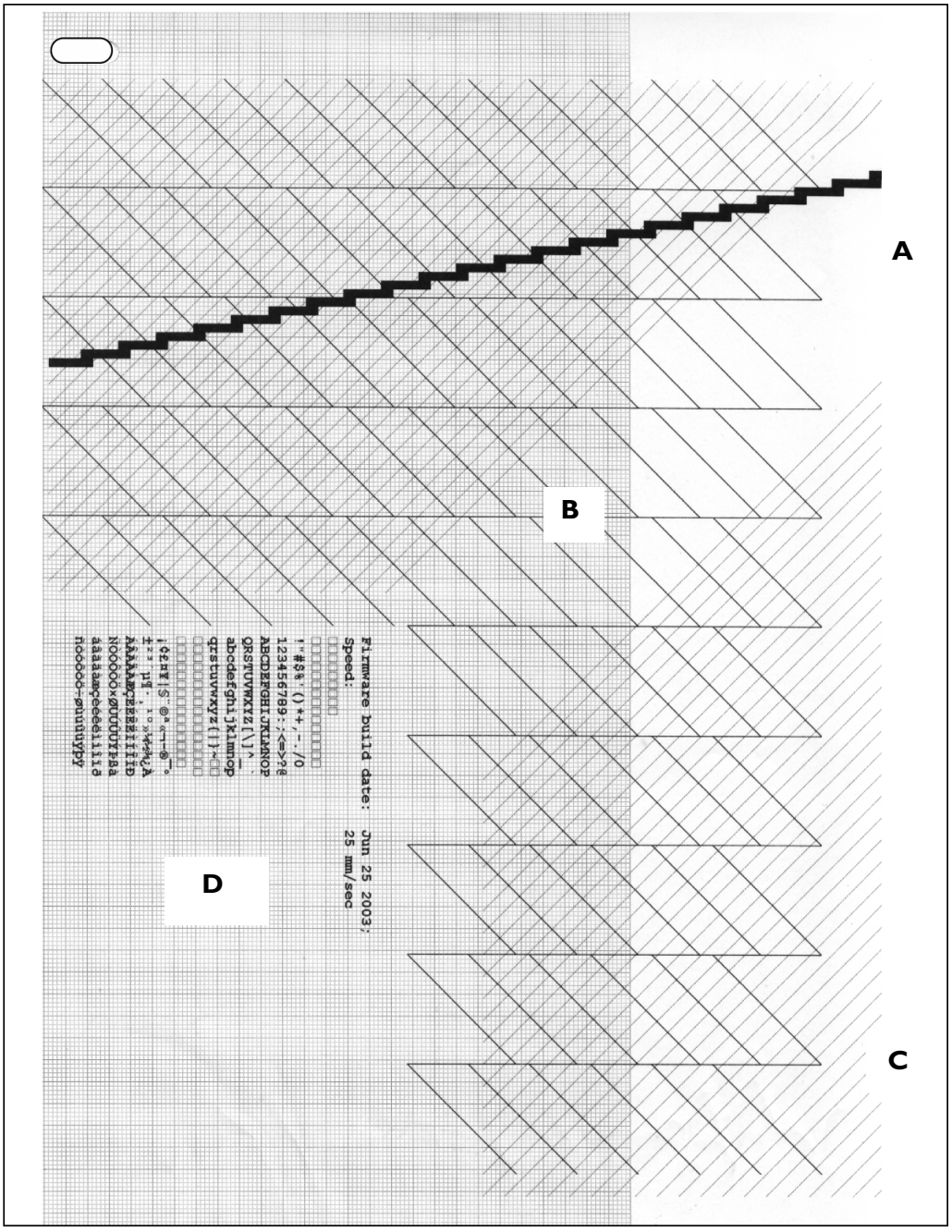
Table B-1 Printer Test Page Description

Test Point	Description
A	The stepped bars are sharp edged and printed cleanly without distortion or missing segments
B	The spacing between the vertical lines is 25 mm with a discrepancy of no more or less than 2%

Table B-1 Printer Test Page Description *(continued)*

C	The diagonal lines should be straight and printed cleanly without distortion or breaks in the lines
D	The character set is printed cleanly without distortion or missing characters, and all characters are clearly legible

Figure B-1 Printer Test Page



4 If the printer test page matches the printer test points as described in Figure B-1, “Printer Test Page Description”, the cardiograph has passed the printer test. If the printer test page does not match the printer test points, the cardiograph has failed the print test.

Network Test

The Network Test displays the configured network information for the cardiograph. All cardiograph network configuration is completed on the Network screen. From any Configuration screen, press and hold down the Alt key on the keyboard, and then press the N key to select the Network tab and to open the Network screen. Before performing the Network test, ensure that the LAN card is fully inserted into the PC Card slot on the rear of the cardiograph, and that the LAN cable is fully inserted into the cable connector on the card.

WARNING **Do not connect the LAN card to a network connector when the cardiograph is connected to a patient.**

CAUTION Only use the shielded LAN cable provided with the PageWriter Trim cardiograph (Philips Part Number 989803138021). Do not use LAN cables with the cardiograph that have not been approved by Philips Medical Systems.

To perform the network test:

1 Turn the Trim Knob to highlight the **Network** button.

2 Press the Trim Knob to select the button. The Network Connection window appears. The configured network information for the cardiograph appears on the window.

3 Review the network data to ensure that it is correct. The **Retry** button is highlighted. If the network data does not display, press the Trim Knob again.

4 If the network data displays correctly, turn the Trim Knob to highlight the **Close** button. Push the Trim Knob to select the button.

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